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APGC/EF AD No. 17568

Air Proving Ground Command

Final Report

TEST CONDUCTED
AT
EGLIN A.F.B. FLORIDA

PROJECT NO. APG/TAT/90-A

SUBJECT: OPERATIONAL SUITABILITY TEST OF THE F-86F AIRPLANE

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HEADQUARTERS
AIR PROVING GROUND COMMAND
Eglin Air Force Base, Florida

4 May 1953

PROJECT NO. APG/TAT/90-A

OPERATIONAL SUITABILITY TEST OF THE F-86F AIRPLANE

1. Transmitted herewith is the Final Report on Project No. APG/TAT/90-A, the object of which was to determine the operational suitability of the F-86F Airplane in the role of a fighter-bomber.

2. The F-86F is basically an F-86E modified to incorporate a more powerful engine and provisions for carrying both an external fuel tank and ordnance under each wing. In addition, the F-86F is equipped with the latest UHF Command Radio and the A-4 Gun-Bomb-Rocket Sight.

3. Test results indicate that the F-86F can perform the fighter-bomber role within the limitations specified by the report.

Patrick W. Timberlake
PATRICK W. TIMBERLAKE
Major General, USAF
Commanding

SECRET
SECURITY INFORMATION

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1. INTRODUCTION:

a. This test was conducted at the request of Headquarters, USAF, by letter, subject: "Operational Suitability Test of the F-86F Airplane," dated 29 September 1952. (See Appendix A.)

b. The North American F-86F is a single place jet fighter, powered by a J47-GE-27 axial flow turbojet engine rated at 6090 pounds of thrust. It has swept-back wings and empennage, hydraulic irreversible controls, an artificial control stick "feel" system, fuselage speed brakes, and an AN/ARC-27 (UHF) radio set. The F-86F dash 25's and dash 30's, which were used for this evaluation, are fighter-bomber versions of the "F" series aircraft. To provide this fighter-bomber capability, four (4) underwing pylons are available for carrying various combinations of fuel tanks, bombs, napalm, etc. In addition, there are six (6) .50 caliber M-3 machine guns and eight (8) 5 inch HVAR posts. A more detailed description of the F-86F is contained in Appendix B. The aircraft used on this project were equipped with leading edge wing slats. However, later aircraft are being fitted with, and older aircraft will be retro-fitted to, solid leading edges which increase the high altitude capabilities of the aircraft.

2. OBJECT: The object of this test was to determine the operational suitability of the F-86F, dash 25 and dash 30 series aircraft, as a fighter-bomber and to evaluate the optimum tactics and techniques for its use as a fighter-bomber.

3. OPERATIONAL ASPECTS:

a. Impact:

(1) Personnel: The introduction of F-86F aircraft into fighter-bomber organizations will not increase the personnel requirement for operations and maintenance over and above those already authorized in appropriate TO&E's.

(2) Training:

(a) Personnel familiar with and proficient in engine and airframe maintenance of F-86E type aircraft will require no additional training to support the F-86F.

(b) As pointed out in previous tests (APG/TAT/52-A-2), highly trained technicians are required to maintain the A-4 Gun-Bomb-Rocket Sight System.

(c) Qualified VHF technicians will require an indoctrination course and "on the job training" for transition to the UHF system of communication.

(d) Jet fighter-bomber pilots will require a minimum of ten (10) hours of transition time to become acquainted with the cockpit arrangement and the sensitive flight characteristics (porpoising) of the F-86F. ?

(e) Training missions in which ordnance is delivered against simulated ground targets are necessary to instruct the pilots in the tactics and techniques for the optimum delivery of ordnance with the F-86F. Dive bombing with the manual pip control (see Appendix B) will require a brief orientation as to the theory and method of operation coupled with a minimum of four (4) bomb runs on a simulated target before pilots will be proficient in this method of bombing.

(f) Experienced fighter-bomber pilots not familiar with the A-series Sights will require approximately five (5) days for familiarization. Pilots familiar with the A-1 Sight will require a short indoctrination for familiarization with the A-4 Sight. Appendix F contains information which can be used for preparation of a suitable training prospectus.

(3) <u>Supply and Equipment</u>:

(a) Supplies and supply problems will remain relatively the same as those of other jet fighter-bomber organizations. Replacement of parts and major components of the aircraft will be approximately that of the F-86E aircraft, except that main gear tire consumption will be greater. (See Appendix F for a list of parts consumed during the test)

(b) Adequate test equipment, mock-ups, and facilities are required for A-4 Sight maintenance. (See Reference 1 and 2, Appendix C)

(c) Adequate test equipment, mock-ups, and facilities are required for UHF radio maintenance.

(d) Standard bomb loading equipment must be modified or new equipment devised for the loading of 1000 pound bombs and full napalm or chemical tanks. (See Appendix E)

(e) A modification must be made to either the bomb pylon or the tank, if chemical tanks are to be used. The M-10 Smoke Tank, even then, will not fit the pylon. (See Appendix E)

(f) Special bomb and rocket racks must be devised if M-38, 100-pound practice bombs, or 8 CM and 2.75-inch FFAR's are to be used. (See Appendix E)

b. Capabilities and Limitations:

(1) General:

(a) The radius of action of the F-86F is approximately 250 nautical miles when carrying two (2) 200-gallon external fuel tanks and two (2) 1000-pound bombs. This and other typical mission profiles are included in Appendix D.

(b) The production F-86F with two (2) 200-gallon tanks on the outboard pylons requires considerably more pilot skill to maintain close formation than the F-86E with two (2) 120-gallon tanks. In addition, F-86F's equipped with external fuel and ordnance loads, above altitudes of 30,000 feet, have a tendency to porpoise slightly. In attempting to stay in close formation, the pilot will tend to over-control and the porpoise will be aggravated.

(c) Extreme caution must be exercised when operating from mat runways because of the limited ground clearance beneath certain types of external ordnance and fuel tanks.

(d) The outboard pylons are to be used for carrying fuel only, since there are no arming facilities at this location. Although the 200-gallon tank is considered the standard installation for the outboard pylon, action is underway to provide modification kits for the 120-gallon tank to permit its installation at that station; also, this interchangeability is considered very desirable from a logistics standpoint.

(e) The handling characteristics, during ground attacks at speeds in excess of 480 knots with external stores are undesirable since there is a tendency for the aircraft to porpoise and become uncontrollable.

(f) The arming wires do not always release when the bomb switch is returned to the "off" position. These whipping wires punch holes in the wings and flap surfaces.

(g) Caution must be exercised in the use of the windshield defroster. It should be turned on only to remove ice and turned off immediately after the ice has been melted.

(2) Gunnery:

(a) The F-86F is capable of conducting air-to-ground gunnery missions against relatively small targets, such as tanks, trucks, gun emplacements, etc., but with accuracies that are somewhat less than for the F-84G aircraft. (See Reference 1, Appendix C) The F-86F is not as stable a gun platform as the F-84G aircraft.

(b) The optimum airspeeds for attacking ground targets are between 400 and 425 knots with the dive brakes extended. At higher airspeeds, small corrections in tracking errors are very difficult to make, and pilots have a tendency to overcontrol and introduce oscillations into the aircraft flight path that are very difficult to control.

(c) The capability of the F-86F to conduct air-to-air missions was not determined due to the accelerated nature of the test. However, the F-86F in support of another APGC test (see Reference 16, Appendix C) successfully made camera gunnery attacks against bomber type aircraft above 45,000 feet. The accuracies obtainable should be at least equal to those of the F-86E (see Reference 2, Appendix C). Clean F-86F's can operate successfully at altitudes as high as 50,000 feet under normal conditions.

(3) Rocketry:

(a) The F-86F, as presently being delivered to the using organizations, is capable of carrying only 5-inch HVAR's. The performance of the F-86F in firing these rockets against ground targets is not significantly different from the F-86E and F-84G aircraft. However, as can be seen from the rocket impacts shown in Appendix D, the expected hit probability against a medium tank (approximately 2 mils radius when firing at 3000 foot slant range) is still small.

(b) The optimum airspeed for attacking targets with rockets is between 400 and 425 knots with the dive brakes extended. Small corrections in tracking errors are extremely difficult to make and pilots should exercise caution so as not to over-control and introduce oscillations.

(c) Although the F-86F was designed to carry only 5-inch HVAR's, special racks were designed by the APGC to carry 8 CM rockets and special APGC adaptors were made to allow loading and firing the 2.75-inch FFAR Century Expendable Launchers. (See Appendix E) Both types of rockets were successfully launched from the F-86F without damage to the aircraft or external fuel tanks. Due to the accelerated nature of the test, the accuracy of the F-86F firing the 8 CM or 2.75-inch rockets was not determined. However, the accuracies obtainable will probably be somewhat less than those for the F-84G because the platform is not as stable. (See Reference 1, Appendix C)

(4) Dive Bombing:

(a) A-4 Automatic Release: Although it is possible to load and carry 500-pound and 1000-pound bombs on the F-86F aircraft, it is not possible to release these bombs automatically by the A-4 Sight System. Attempts to release the bombs automatically result in the bombs striking and damaging the under surface of the wings and flaps. In view of this, bombs were not dropped with the sight set for "automatic" releases and

consequently, the accuracy of the system is not known. However, it is not expected that the accuracy would be significantly different from that of the F-84G aircraft in automatic dive bombing with the A-4 sight (CEP of 58 mils with release altitude of 3000 to 5000 feet, see Figure 8, Appendix D.)

(b) Fixed Sight Bombing: Dive bombing with the sight set in a fixed position and the pilot manually releasing the bombs, requires considerable skill. Even a well qualified and proficient pilot will not be able to consistantly obtain hits against targets the size of tanks or trucks using the fixed sight method of dive bombing. Of the twenty (20) bombs dropped by this method during this test, the circular error probable was 55 mils, with the mean point of impact being displaced 244 feet short and 45 feet to the left of the target. (See Figure 4, Appendix D.)

(c) Manual Pip Control Bombing: A detailed description of the manual pip control bombing system (MPC) is given in Appendix B. This system was proposed by The North American Aviation, Incorporated, as a solution to the bombing problem with the F-86F and similar aircraft. The accuracies that can be obtained by using this system are an improvement over the other methods of dive bombing; however, these accuracies do not give the F-86F the capability of bombing small tactical targets. The results obtained when bombing with the MPC system indicate that the optimum dive angle is approximately 50 degrees with a resulting CEP of 43 mils. Dives from 32 to 70 degrees result in a CEP of 51 mils and 34 mils respectively; however, the optimum grouping of the bombs about the target is obtained in the 50 degree dive.

(5) Napalm Bombing: E-74 Fire Bombs can be released at airspeeds from 250 knots to 515 knots without damage to the airplane or external fuel tanks. Releases at speeds in excess of 515 knots, or single releases at speeds above 480 knots when carrying two (2) 200 gallon external tanks, will cause the aircraft to oscillate (porpoise) violently and tend to become

uncontrollable. (See Appendices D and F) The accuracy of napalm bombing with the F-86F remains the same as with the F-86E and F-84G aircraft.

(6) Armament Loading:

(a) The loading of the six (6) .50 caliber guns and the loading of the 5 inch HVAR's imposes no difficulties for armament personnel. The time required to load these munitions remains the same as for the F-86E and F-84G aircraft.

(b) The loading of 1000 pound bombs cannot be adequately performed with present bomb loading equipment. The M-7 and M-8 Portable Bomb Hoist can be used to load 1000 pound bombs, but due to the nearness of the aircraft's wing to the operator, and the nearness of the bomb shackle to the ground, it places the operator in an uncomfortable and awkward position.

(c) The loading of E-74 fire bombs cannot be adequately performed with present bomb loading equipment. The bombs will have to be loaded empty and filled after being secured to the aircraft.

(d) Special dollies for loading 1000 pound bombs and full napalm tanks have been devised and the plans are presented in Appendix E. These dollies prove to be workable and efficient in operation; however, they have not been approved by USAF at this time.

(e) Standard M-10 smoke tanks and E-26 chemical tanks cannot be used on the F-86F aircraft. However, with a special modification to the bomb pylons, it is possible to install the E-26 tanks. (See Appendix D)

(7) Maintenance: Maintenance for the F-86F remains the same as with the F-86E and F-84G aircraft. A detailed description of the maintenance required for the aircraft and its major components during the period it was undergoing operational suitability testing is given in Appendix E.

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(7) Maintenance: Maintenance for the F-86F remains the same as with the F-86E and F-84G aircraft. A detailed description of the maintenance required for the aircraft and its major components during the period it was undergoing operational suitability testing is given in Appendix E.

c. Operational Techniques: The techniques to be used in the employment of the F-86F as a fighter-bomber are not significantly different from those employed with the F-86E and F-84G. A detailed outline of the techniques recommended for the employment of the F-86F is given in Appendix F.

4. CONCLUSIONS:

a. The F-86F is capable of performing the role of a fighter-bomber within the limitations specified above.

b. The F-86F is not as stable an ordnance platform as the F-84G and smooth tracking of ground targets is difficult.

c. Airfields and operating areas should be in a relatively smooth condition for the operation of F-86F's with external ordnance.

d. The rocket carrying capabilities of the F-86F, presently limited to 5-inch HVAR's, is considered inadequate.

e. The probability of destroying small tactical targets such as trucks or flak guns with 5-inch rockets or by dive bombing with the F-86F is small.

f. Adequate loading equipment for 1000-pound bombs and full E-74 fire bombs or E-26 chemical tanks is not available.

g. The F-86F does not have a smoke or chemical laying capability without aircraft or chemical tank modifications.

5. RECOMMENDATIONS: It is recommended that:

a. A study be made to determine the cause of the marginal stability and subsequent action be taken to increase the stability of the F-86F during flights with external ordnance, above 30,000 feet and during high speed ground attacks.

b. Immediate action be taken to increase the rocket carrying capability of the F-86F to include 8 CM rockets and 2.75-inch FFA Rockets.

c. Suitable bomb and napalm tank loading equipment be designed and made available to F-86F organizations.

d. A suitable chemical tank be developed for use on the F-86F.

e. Additional testing be conducted with the Manual Pip Control.

f. The sight reticle camera lens adaptor be reduced in size, and that the scoop camera lens be changed to a 3-inch lens.

g. Strike cameras be installed on the F-86F.

h. Pilots receive a thorough indoctrination course on the use of the A-4 Gun-Bomb-Rocket Sight System.

i. A positive means of releasing the arming wires be provided.

j. Immediate action be taken to provide modification kits for carrying of the 120-gallon tanks on the outboard pylons.

k. Investigations be made to determine the feasibility of providing armament facilities for the outboard pylon, to allow carrying extra munitions when the tactical situation permits.

l. A Final Phase Squadron Test be conducted jointly by the Air Proving Ground Command and the Tactical Air Command to determine the unit capabilities of the F-86F.

Patrick W. Timberlake

PATRICK W. TIMBERLAKE
Major General, USAF
Commanding

C O P Y

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
Washington 25, D. C.

AFDRQ-TA-S 29 Sep 52

SUBJECT: Operational Suitability Test of the F-86F Airplane

TO: Commanding General
Air Proving Ground Command
Eglin Air Force Base
Florida

1. Request an Operational Suitability Test of the F-86F airplane as a fighter-bomber be conducted under USAF priority of 1A APGC precedence of 13A on APGC Precedence List of 1 March 1952. Three (3) F-86F aircraft have been allocated APGC for this purpose under Project APG2F-771. These aircraft will be the first available fighter-bomber versions of the F-86F. Direct communication with Headquarters, Air Materiel Command, and Headquarters, Air Research and Development Command is authorized in order to effect delivery of aircraft and equipment necessary for this test.

2. The fighter-bomber version of the F-86F differs from earlier models in that four (4) underwing pylons are installed, allowing simultaneous carriage of bombs and external fuel. For this reason, it is believed that much of the basic information obtained from the F-86F aircraft assigned to Project Gun-Val will apply to the fighter-bomber test.

3. Test of this aircraft should be programmed to determine the suitability of the F-86F to perform the fighter-bomber mission. The following points should be emphasized during test:

a. Take-off requirements with various external store configurations, from mat runways as well as concrete runways.

b. The air-to-air capability of the fighter-bomber with no external stores during combat.

c. The capability to evade enemy fighter aircraft when carrying a special weapon (TX-12). (It is realized that the solution to this

SUBJECT: OST of the F-86F Airplane (Cont'd)

problem may depend on the development of tactics and techniques of penetration rather than reliance on performance alone.)

d. Optimum dive bombing techniques with either conventional weapons or the TX-12.

e. Radius of action:

(1) With two (2) 1000 lb bombs and two (2) 120 gallon external fuel tanks.

(2) With two (2) 1000 lb bombs and two (2) 200 gallon external fuel tanks.

(3) With one (1) TX-12 special weapon and maximum fuel.

(4) With 8x5 inch HVARockets and external fuel.

(5) With 8cm rockets and external fuel.

(6) With no external munitions and maximum external fuel.

4. This letter confirms TWX Directive, Headquarters USAF, Assistant for Development Programming, DCS/Development, dated 16 June 1952.

BY COMMAND OF THE CHIEF OF STAFF:

/t/&/s/ JAMES O. GUTHRIE
Colonel, USAF
Deputy Director of Requirements

DETAILED DESCRIPTION OF THE F-86F

1. The North American F-86F is a single place jet fighter, powered by a J47-GE-27 axial flow turbojet engine rated at 6090 pounds of thrust. The aircraft is characterized by swept-back wings and empennage, a combination of elevator and stabilizer into one unit known as the controllable horizontal tail, a completely hydraulic and irreversible system for control surface operation, an artificial "feel" system to provide comfortable stick forces, and fuselage speed brakes.

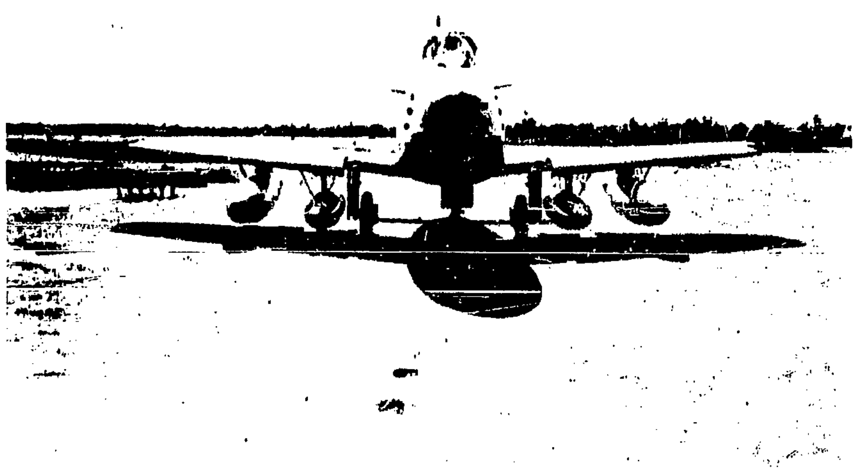
2. This aircraft was designed primarily as a high speed, high altitude fighter; however, the dash 25 and dash 30 series were modified for the fighter-bomber role. These series of aircraft differ from preceding "F" series aircraft in that the wing was structurally built to take the loads of 200 gallon external tanks at outboard station 118 accompanied by external ordnance carried at inboard station 72.5. Bombs, rockets and napalm can be carried in company with the 200 gallon tanks.

3. The aircraft is equipped with six (6) .50 caliber machine guns mounted in the forward fuselage and aimed by the A-4 Gun-Bomb-Rocket Sight and AN/APG-30 Gun Ranging Radar.

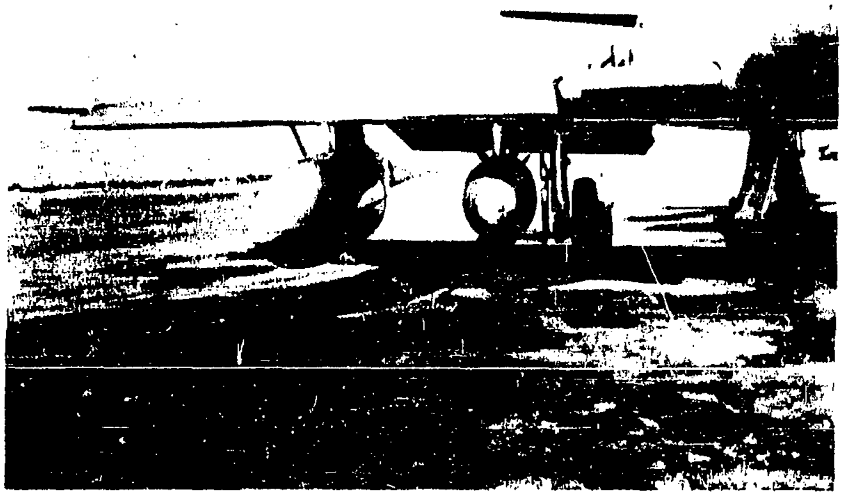
4. The aircraft is also equipped with an AN/ARC-27 Command Radio Set (UHF).

5. There are numerous combinations of external configurations capable of being carried by the F-86F dash 25 and dash 30 series aircraft. The following configurations are the most probable configurations to be used:

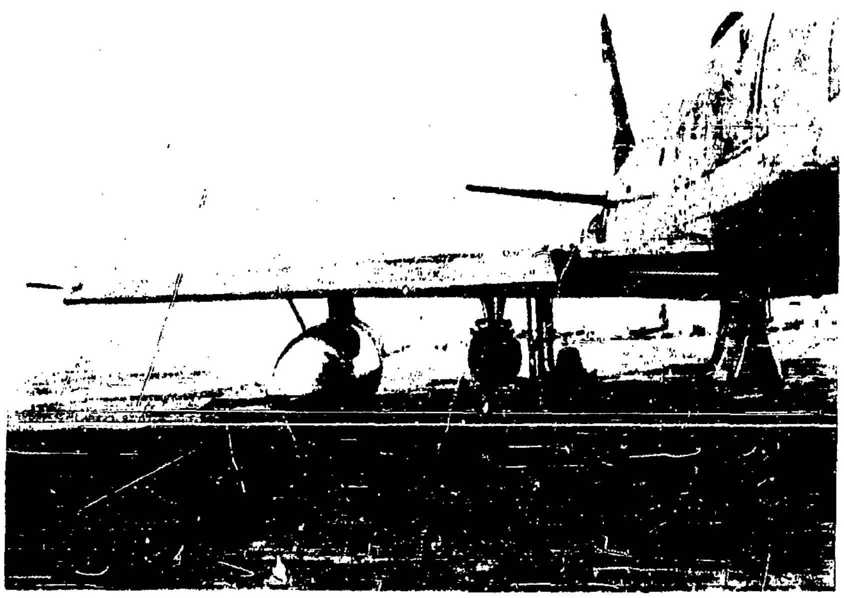
a. Two (2) 200 and two (2) 120 external fuel tanks:



b. Two (2) 200 gallon fuel tanks and two (2) 1000 pound bombs.

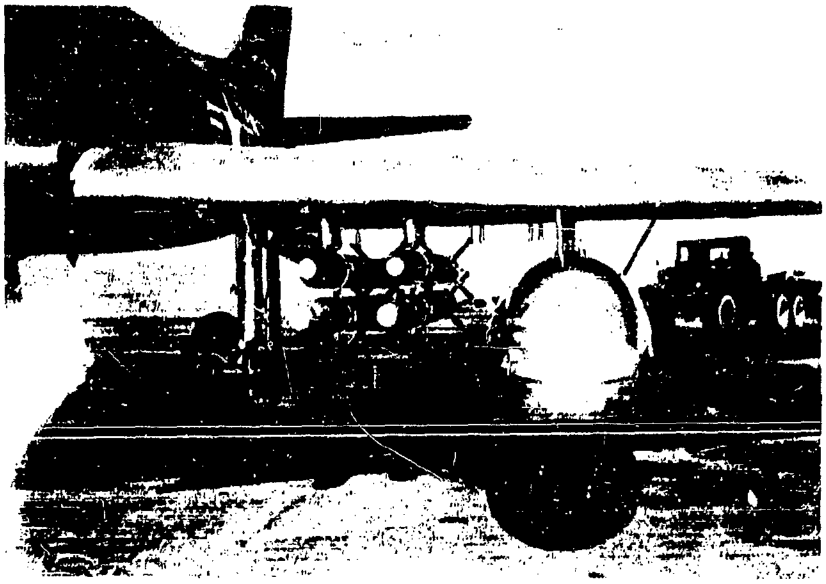


c. Two (2) 200 gallon fuel tanks and two (2) 500 pound bombs.

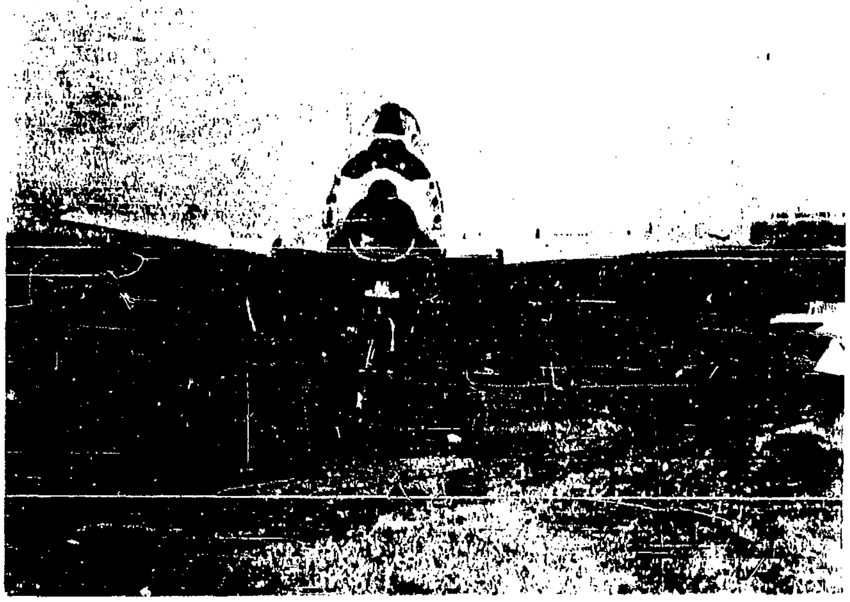


d. Two (2) 200 gallon fuel tanks and two (2) E-74 (same as E-26 chemical tanks) napalm tanks:

e. Two (200) gallon fuel tanks and eight (8) 5 inch HVAR's:

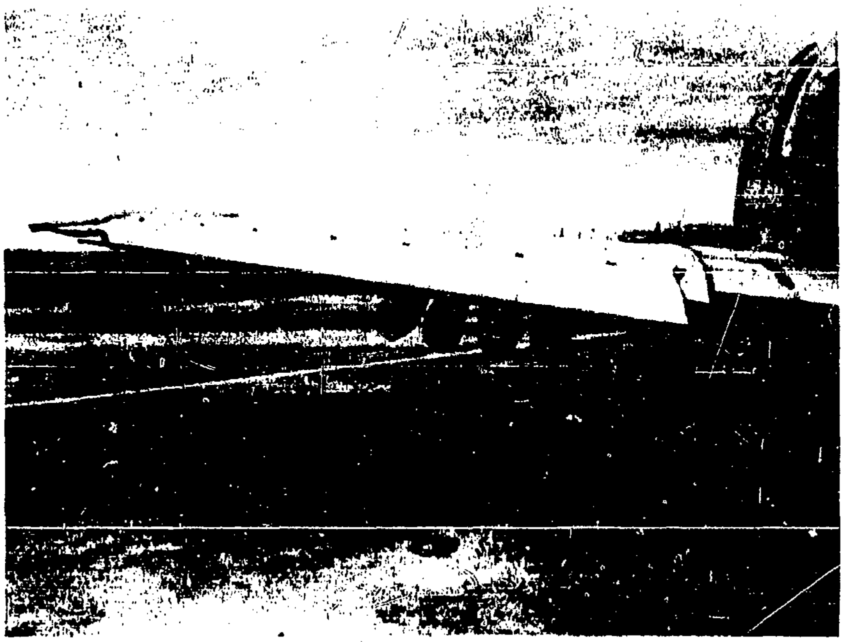


f. Sixteen (16) 5 inch HVAR's:



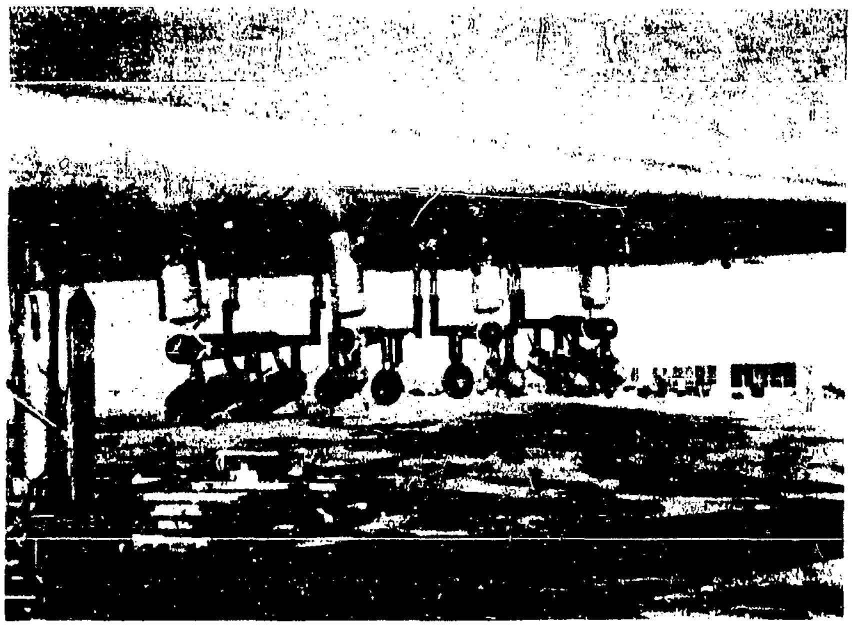
g. Two (2) 200 gallon fuel tanks and four (4) Century Launchers (seven (7) 2.75 inch FFAR's in each pod):

h. Eight (8) Century Launchers (total of fifty-six (56) 2.75 inch FFAR's):

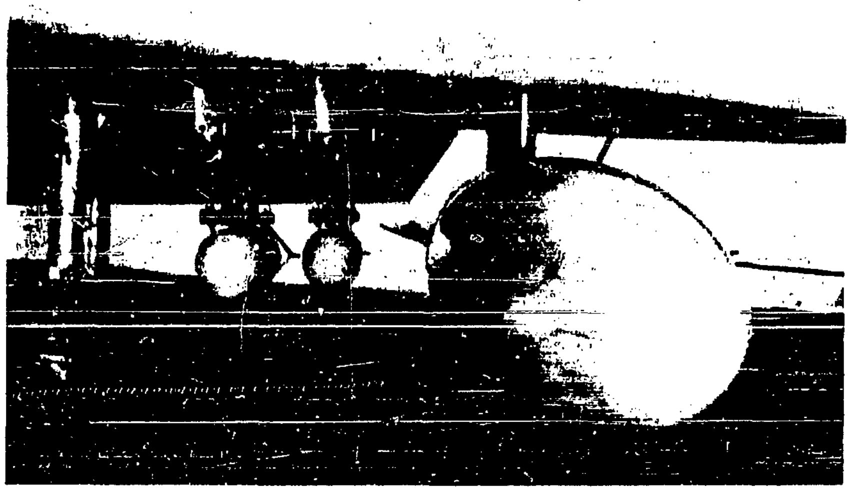


i. Two (2) 200 gallon fuel tanks and eight (8) 8 CM rockets (locally manufactured racks):

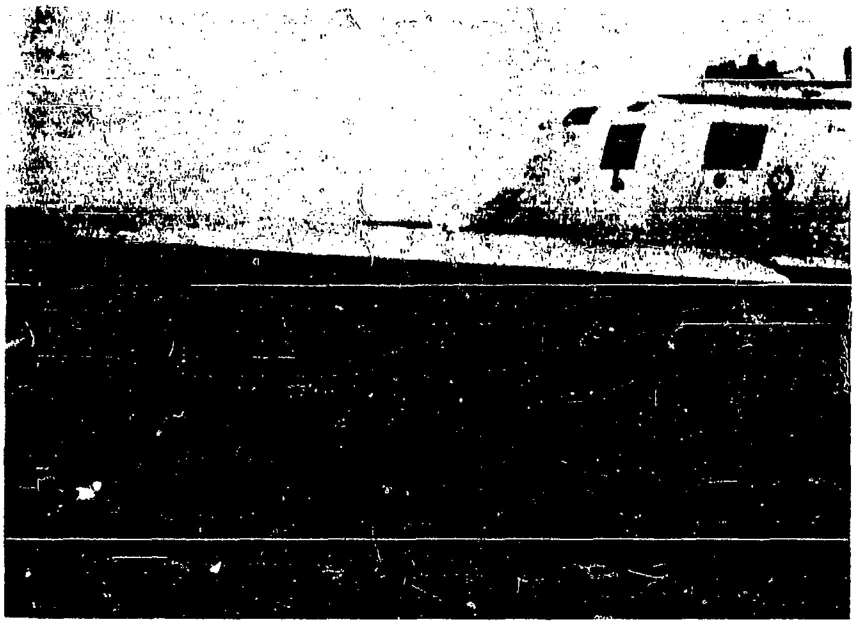
j. Sixteen (16) 8 CM rockets (locally manufactured racks):



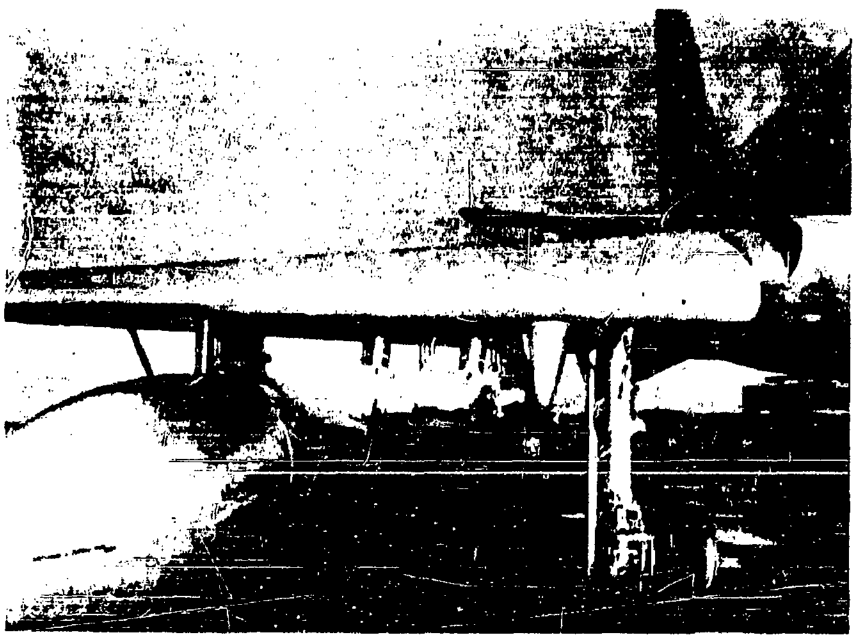
k. Two (2) 200 gallon fuel tanks and 4 M-38 100 pound practice bombs (locally manufactured racks):



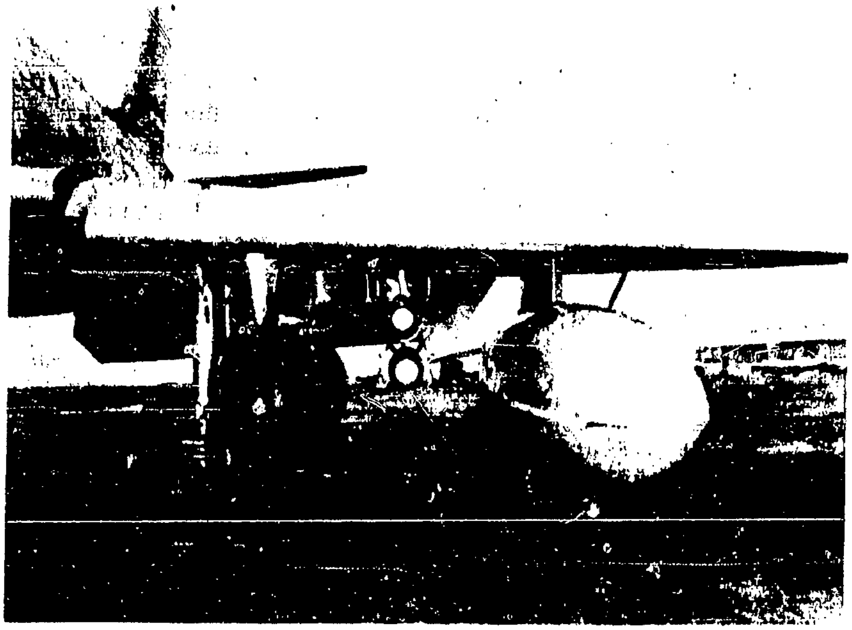
l. Eight (8) M-38 100 pound practice bombs (locally manufactured racks):



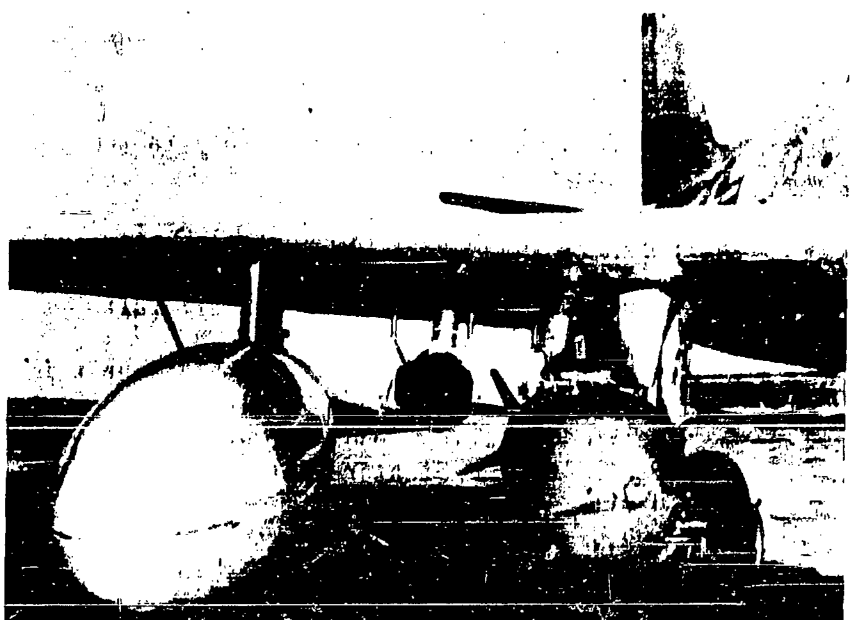
m. Two (2) 200 gallon fuel tanks and two (2) M-30 100 pound practice drill bombs:



n. Two (2) 200 gallon fuel tanks, two (2) 1000 pound bombs and four (4) 5 inch HVAR's:



o. Two (2) 200 gallon fuel tanks, two (2) 1000 pound bombs and two (2) Century Launchers:



6. Detailed description of the Manual Pip Control system for dive bombing with the F-86F aircraft:

a. Introduction:

(1) The F-86F airplane is equipped with the A-4 Gun-Bomb-Rocket Sight. In current operational and training practice, the A-4 "automatic" bombing function is not used in dive bombing since it is prohibited by Technical Order No. 01-60JL-69, 4 December 1951. Rather, a rocket off-set position of the sight is used to provide an approximation of the required lead. Use of this technique of sight operation requires that a similar approach, entry and dive angle be used for each pass. Although this method is useful for training, it is considered unsatisfactory for combat operations where the tactical situation requires considerable flexibility.

(2) The Manual Pip Control system has been devised to improve the dive bombing function in the F-86F. Its purpose is:

(a) To make available a control which will displace the A-4 pip to the required lead position for any useable approach.

(b) To provide simple but effective aids to help the pilot attain and recognize the proper release conditions.

(c) To provide additional safety in the dive bombing operation.

b. Description of the Manual Pip Control System for Dive Bombing: The Manual Pip Control system consists of the Manual Pip Control unit, the bombing altimeter and canopy lines for the F-86F aircraft.

(1) Manual Pip Control Unit (MPC): This unit is shown in photograph numbers 1 and 2 below. Its principle purpose is to provide a control which will electrically depress the A-4 Sight reticle through a range of 0 to 174 mils. An on-off toggle switch shown in the photographs, actuates the MPC. When this switch is in the "Normal" position, the A-4 will function normally; when placed in the "Bomb" position, the MPC takes over

control of the pip and fixes it in electrical cage at the depression selected by the knob control. (The A-4 Sight function selector lever on the center pedestal must be in either the "Gun" or "Rocket" position for use with the MPC.) The MPC has been provided with four (4) sets of dials, one (1) fixed on the face, and three (3) others which fold down over the control knob. The fixed dial is calibrated in mils of lead angle; operation of the knob depresses the pipper of the A-4 to any desired value from 0 to 174 mils. The three (3) folding dials represent three (3) initial entry conditions and have two (2) scales each. The inner (green) scale is marked "Dive Angle" and the outer (red) scale is marked "Index Altitude." These two (2) scales have been calibrated in terms of the F-86F dive characteristics for the following entry and terrain clearance conditions:

(a) Controls: Speed brakes extended and throttle in full idle position at entry.

(b) Entry Altitude and Airspeed: The three (3) sets of dials represent the following three (3) stabilized entry conditions:

Altitude Above Target	Indicated Airspeed
10,000 feet	305 knots IAS
15,000 feet	288 knots IAS
20,000 feet	270 knots IAS

(The airspeeds represent the speed for best climb at these altitudes.)

(c) Terrain Clearance: The scales have been calibrated to give a 2,500 foot terrain clearance for a 5 "g" pull-out initiated at the release altitude indicated on the bombing altimeter. If the above entry conditions are followed, the airspeed at any altitude during the dive is accurately known (see Figures 1 thru 8) and the required release altitude, lead, and terrain clearance for the dive angle chosen are determined. Dive angles from 20^{0} to 80^{0} are available. The "Index Altitude" scale gives the correct sea level target release altitude for the dive angle chosen. The bombing altimeter adds

the necessary correction for actual target altitude. The bombing altimeter is connected to the static source and reads outside pressure altitude.

(2) The Bombing Altimeter: (See photograph number 3.) This instrument consists of a standard cabin altimeter with a dial attached to the face. The principle purpose of the bombing altimeter is to give the pilot an accurate and safe bomb release and pull-out indication, therefore, it is placed immediately adjacent to the A-4 reflector plate where it may be seen with a minimum of distraction from the tracking operation.

(3) Canopy Lines: The canopy lines shown in photograph number 4 are provided to check dive angle. This is done by reading of the line nearest to the horizon or other horizontal reference, such as base of cloud cover. Photograph number 5 shows the installation of the MPC and the bombing altimeter in an F-86F.

7. See Appendix D for test procedures and results.

8. See Appendix F for operational techniques.

control of the pip and fixes it in electrical cage at the depression selected by the knob control. (The A-4 Sight function selector lever on the center pedestal must be in either the "Gun" or "Rocket" position for use with the MPC.) The MPC has been provided with four (4) sets of dials, one (1) fixed on the face, and three (3) others which fold down over the control knob. The fixed dial is calibrated in mils of lead angle; operation of the knob depresses the pipper of the A-4 to any desired value from 0 to 174 mils. The three (3) folding dials represent three (3) initial entry conditions and have two (2) scales each. The inner (green) scale is marked "Dive Angle" and the outer (red) scale is marked "Index Altitude." These two (2) scales have been calibrated in terms of the F-86F dive characteristics for the following entry and terrain clearance conditions:

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10,000 feet	305 knots IAS
15,000 feet	288 knots IAS
20,000 feet	270 knots IAS

(The airspeeds represent the speed for best climb at these altitudes.)

(c) Terrain Clearance: The scales have been calibrated to give a 2,500 foot terrain clearance for a 5 "g" pull-out initiated at the release altitude indicated on the bombing altimeter. If the above entry conditions are followed, the airspeed at any altitude during the dive is accurately known (see Figures 1 thru 6) and the required release altitude, lead, and terrain clearance for the dive angle chosen are determined. Dive angles from 20° to 80° are available. The "Index Altitude" scale gives the correct sea level target release altitude for the dive angle chosen. The bombing altimeter adds

the necessary correction for actual target altitude. The bombing altimeter is connected to the static source and reads outside pressure altitude.

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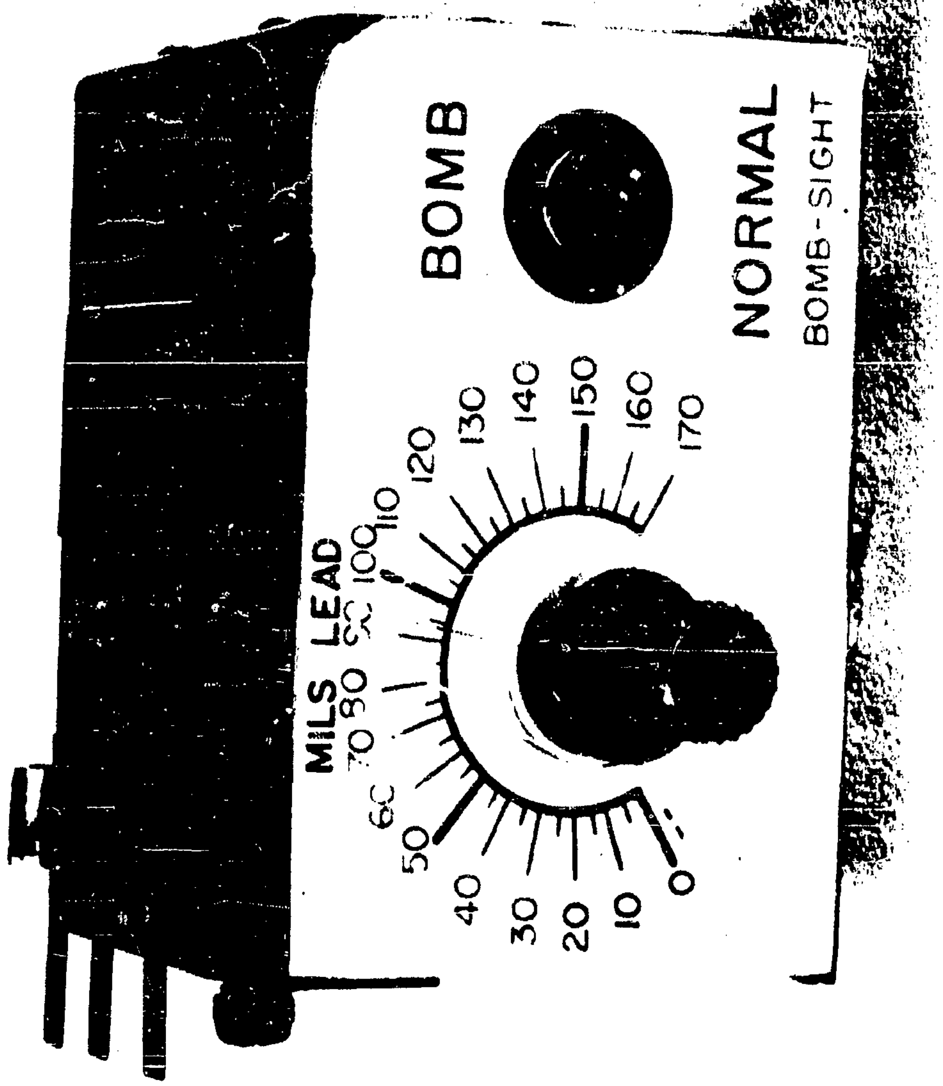
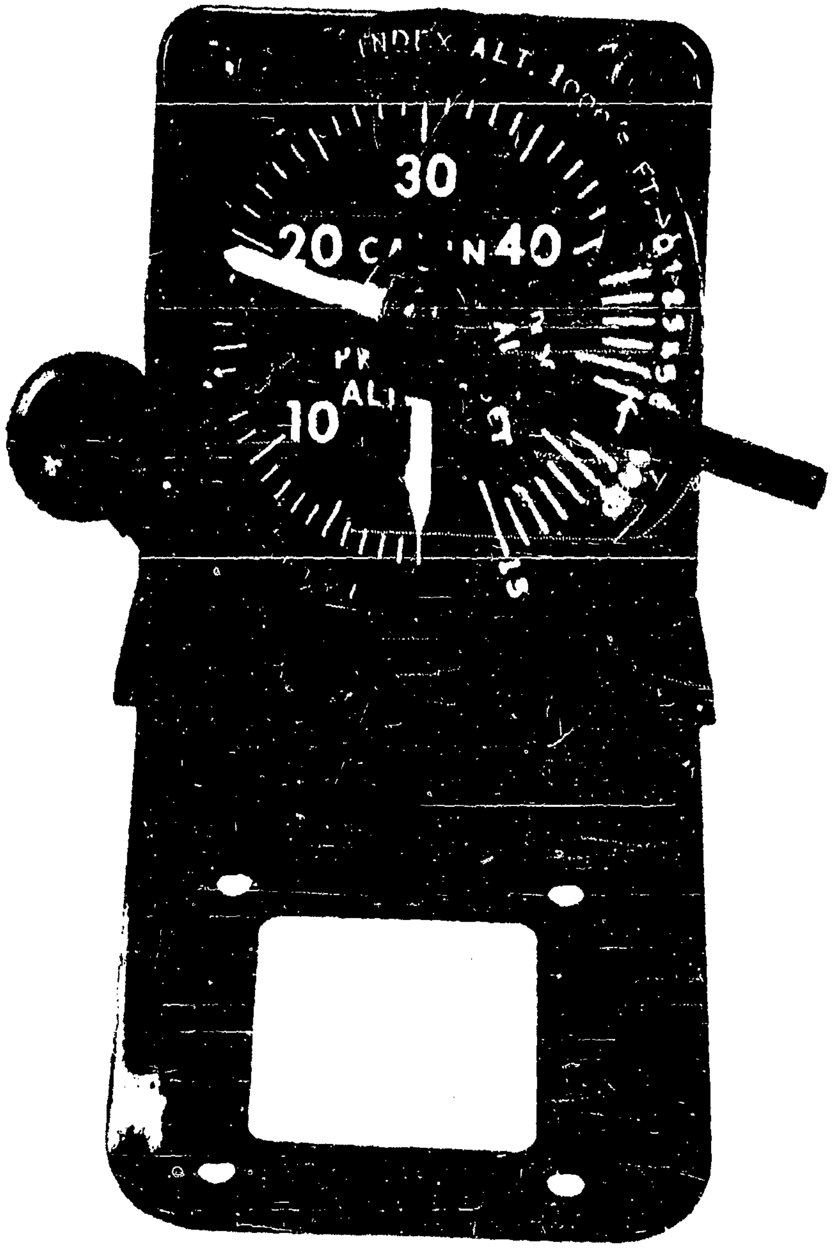
7. See Appendix D for test procedures and results.

8. See Appendix F for operational techniques.

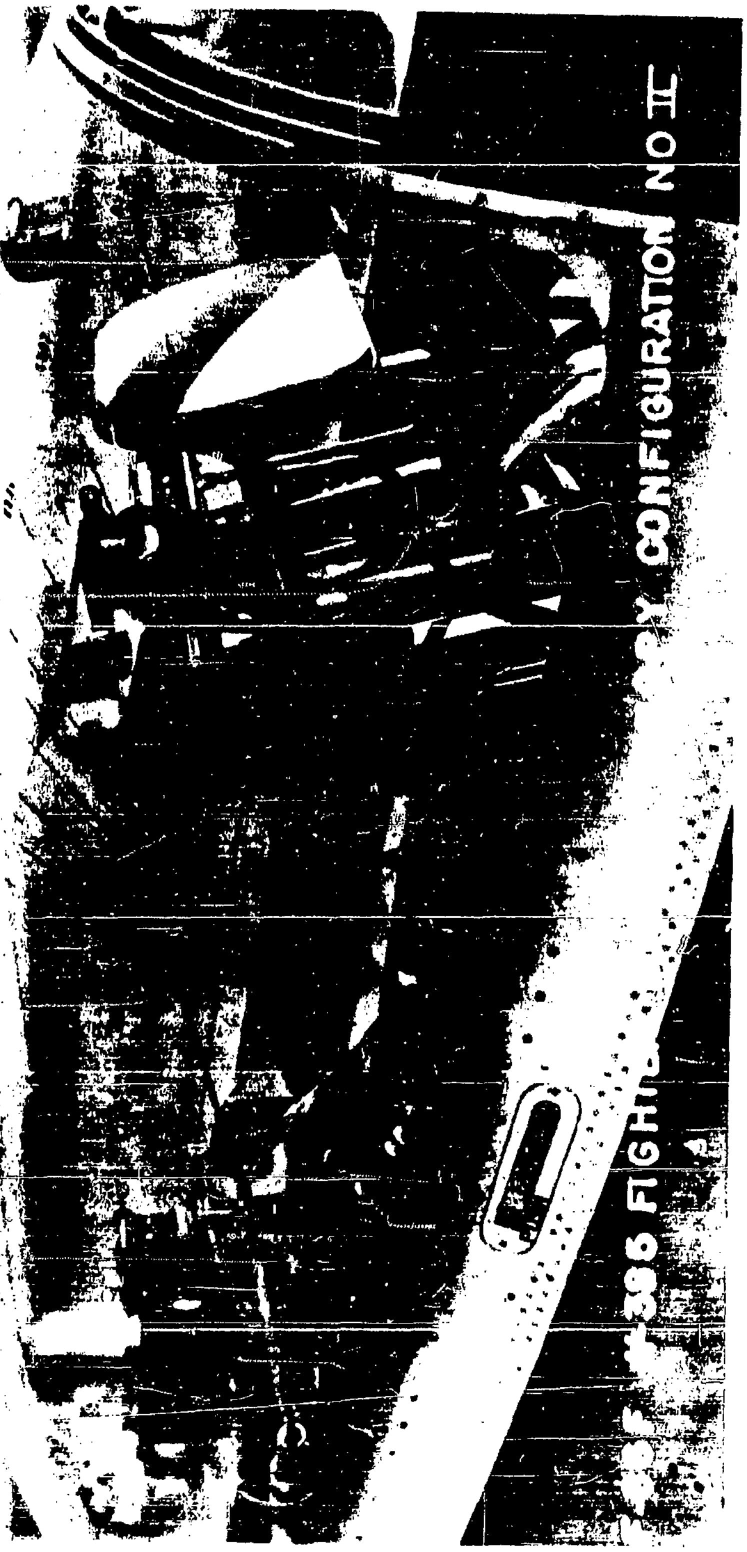


Photograph #1
Manual Pip Control Unit

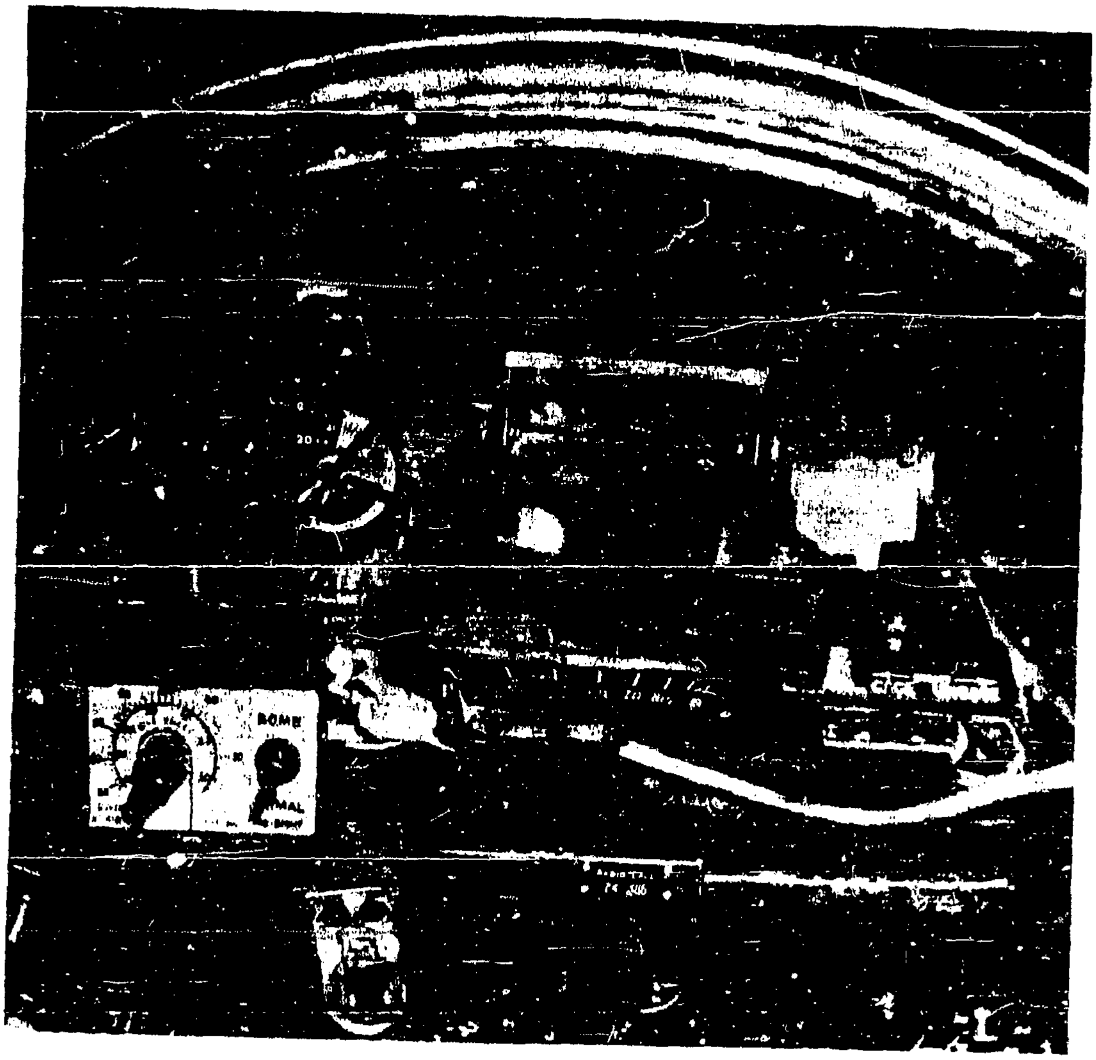
Photograph #2
Manual Pip Control Unit



Photograph #3
Bombing Altimeter



Photograph #4
Canopy Lines.



Photograph #5
Manual Pip Control Unit and Bombing Altimeter in F-86F Aircraft.

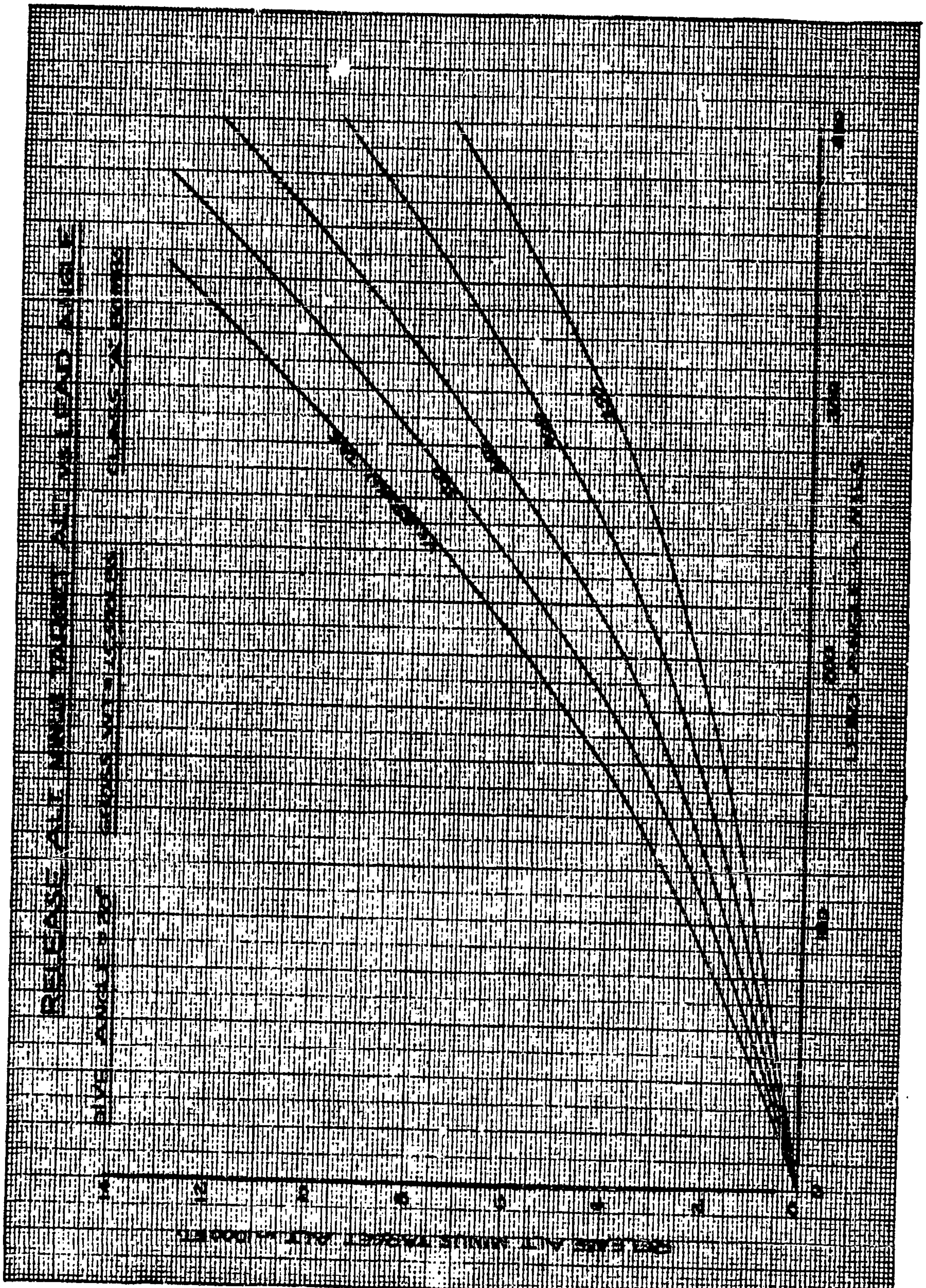


Figure #1

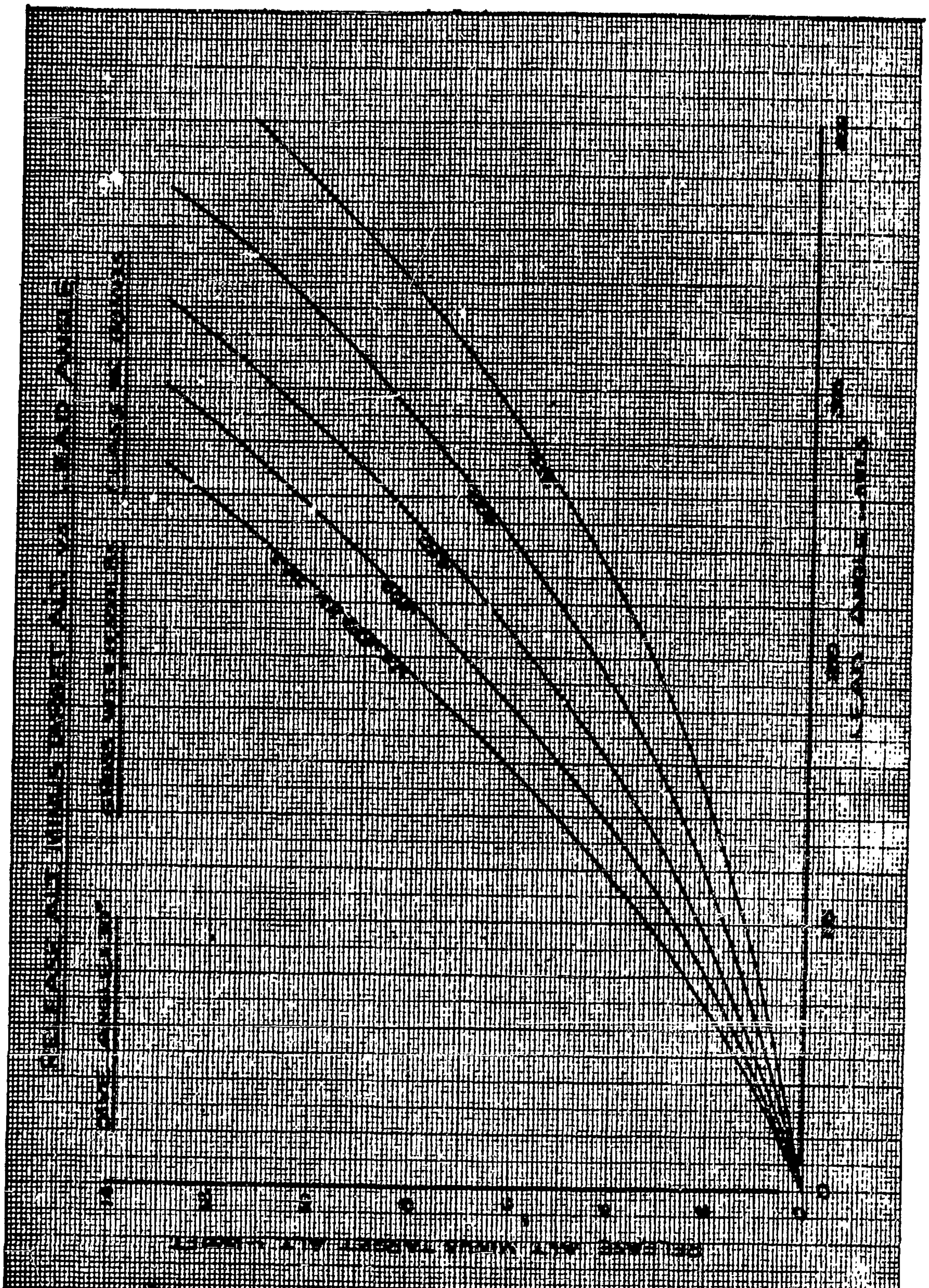


Figure #2

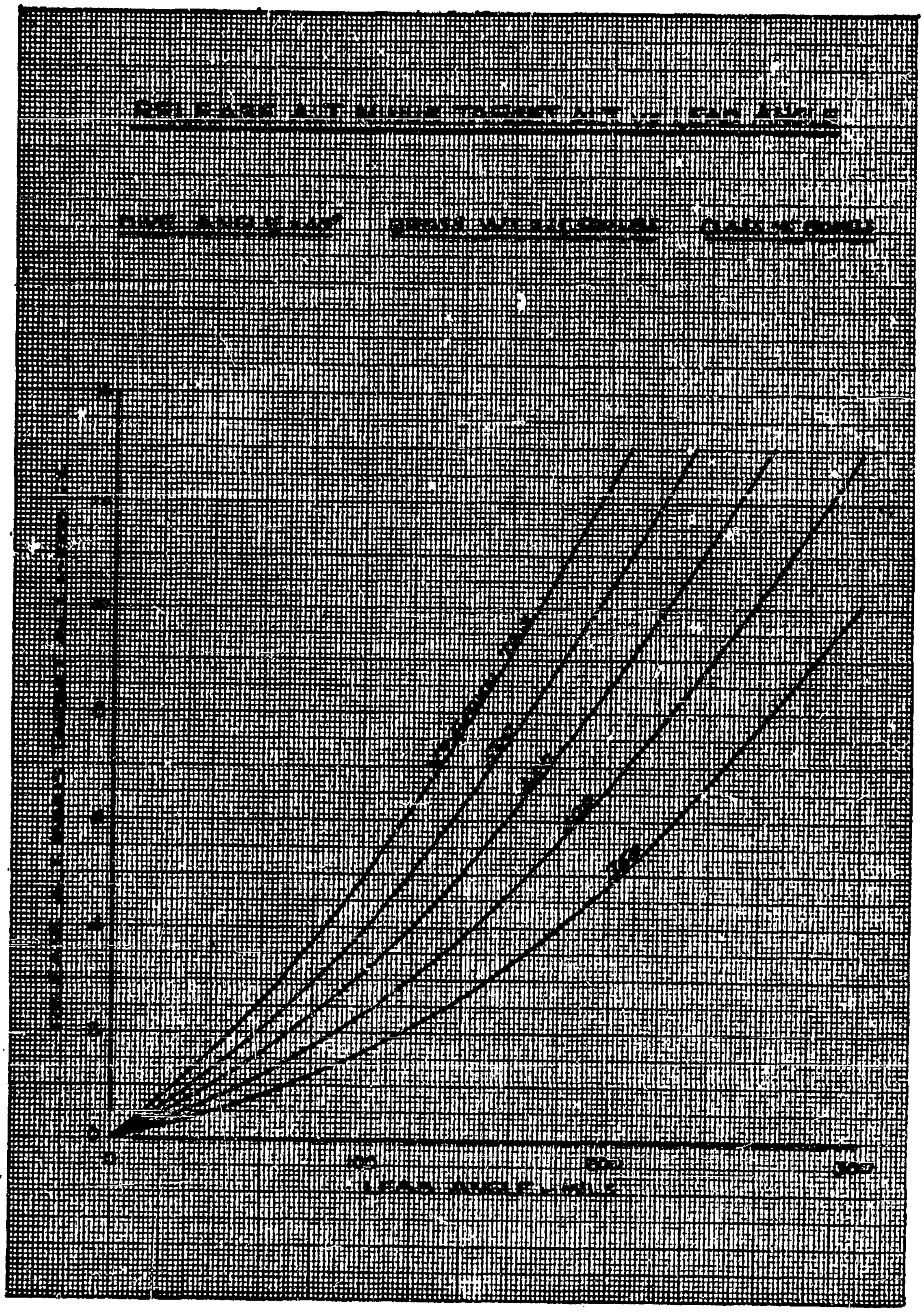


Figure #3

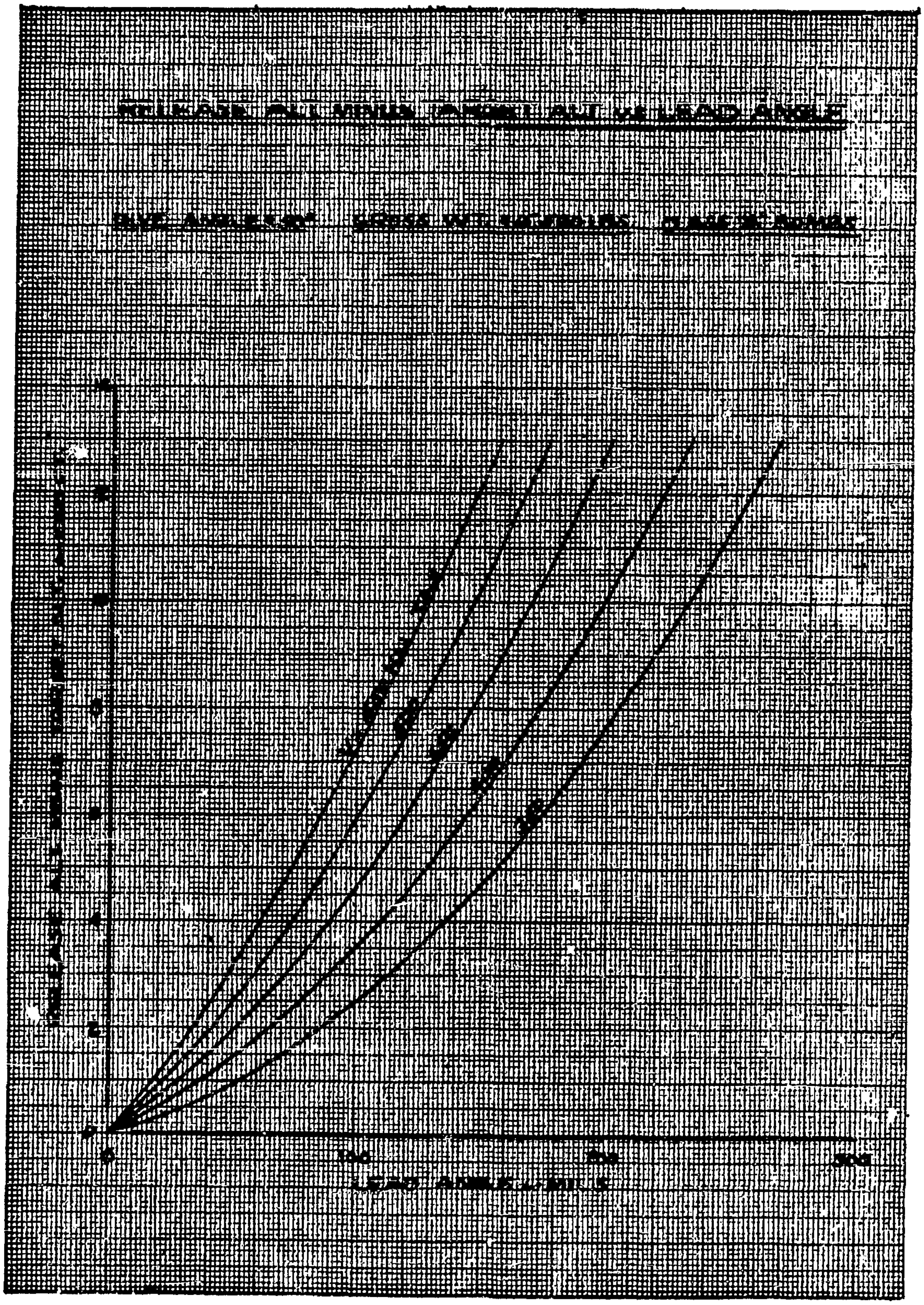


Figure #4

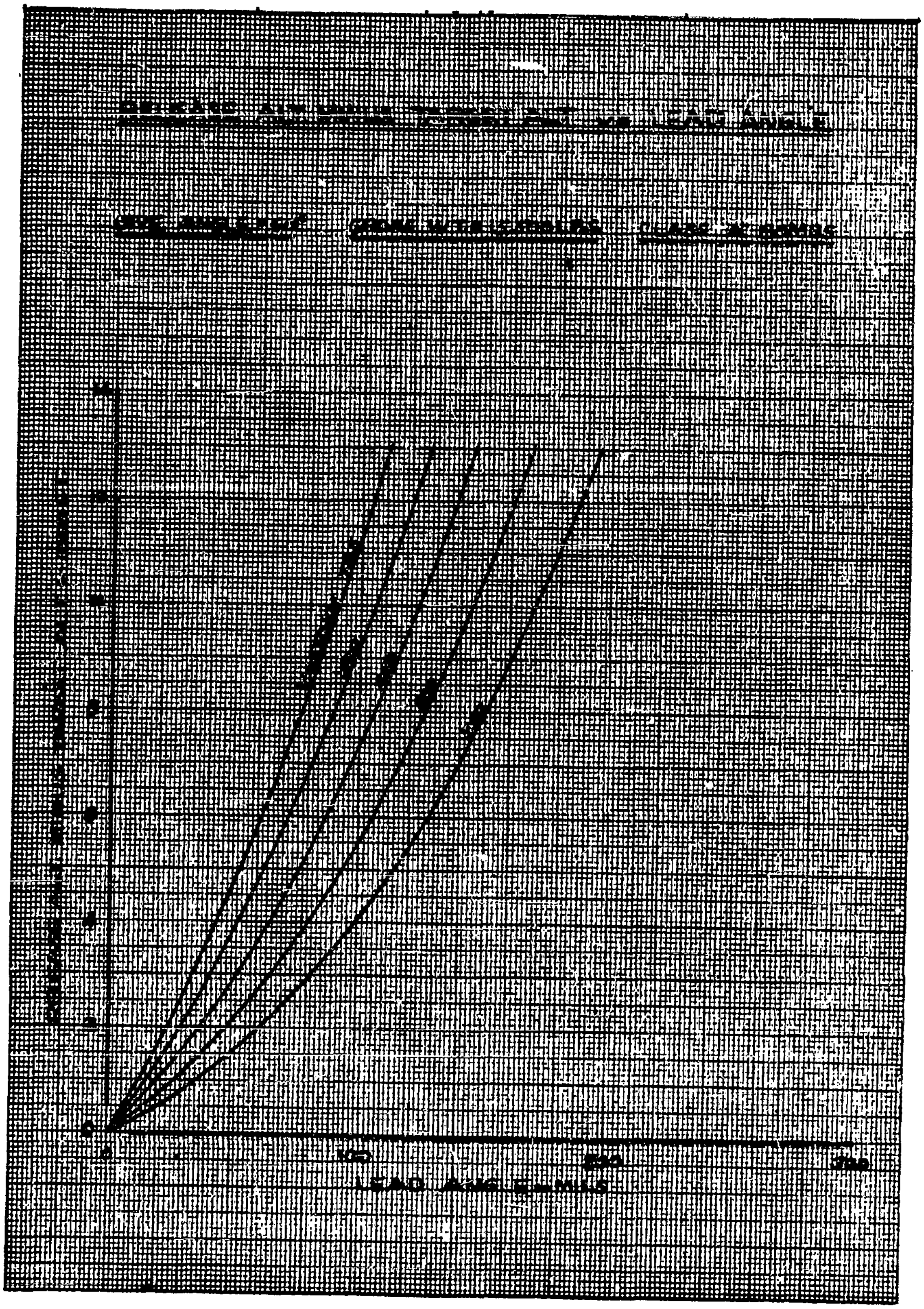


Figure #5

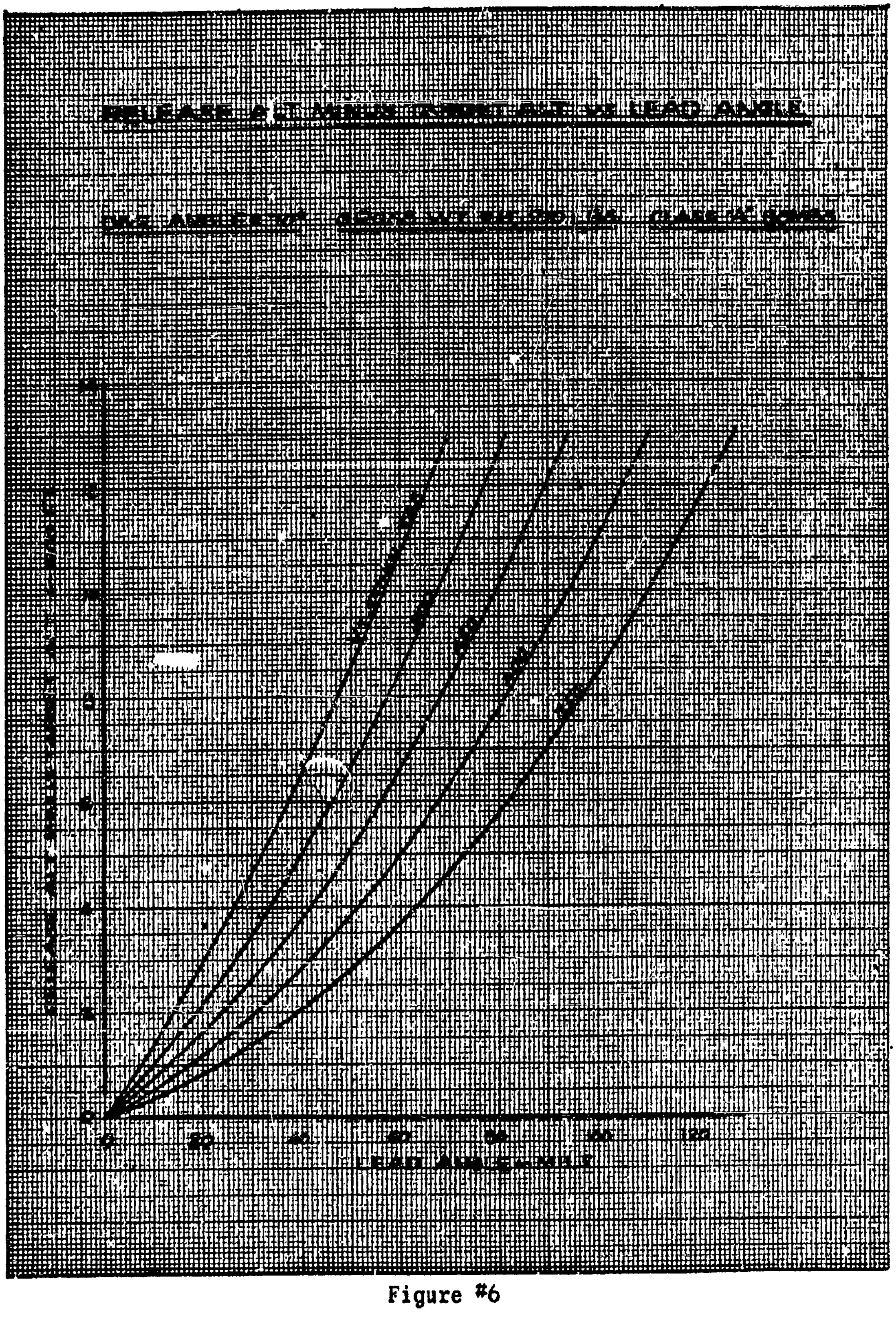


Figure #6

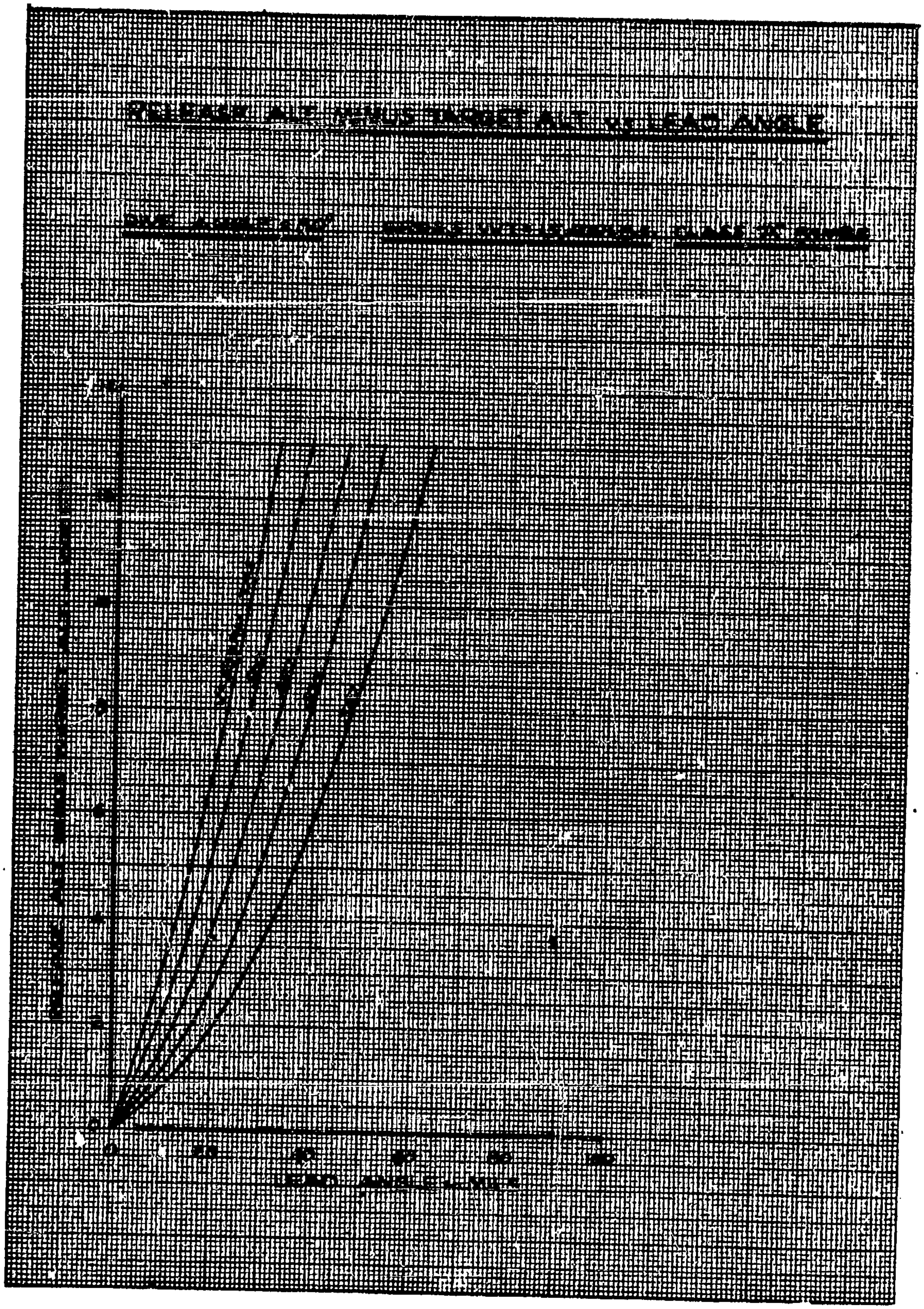


Figure #7

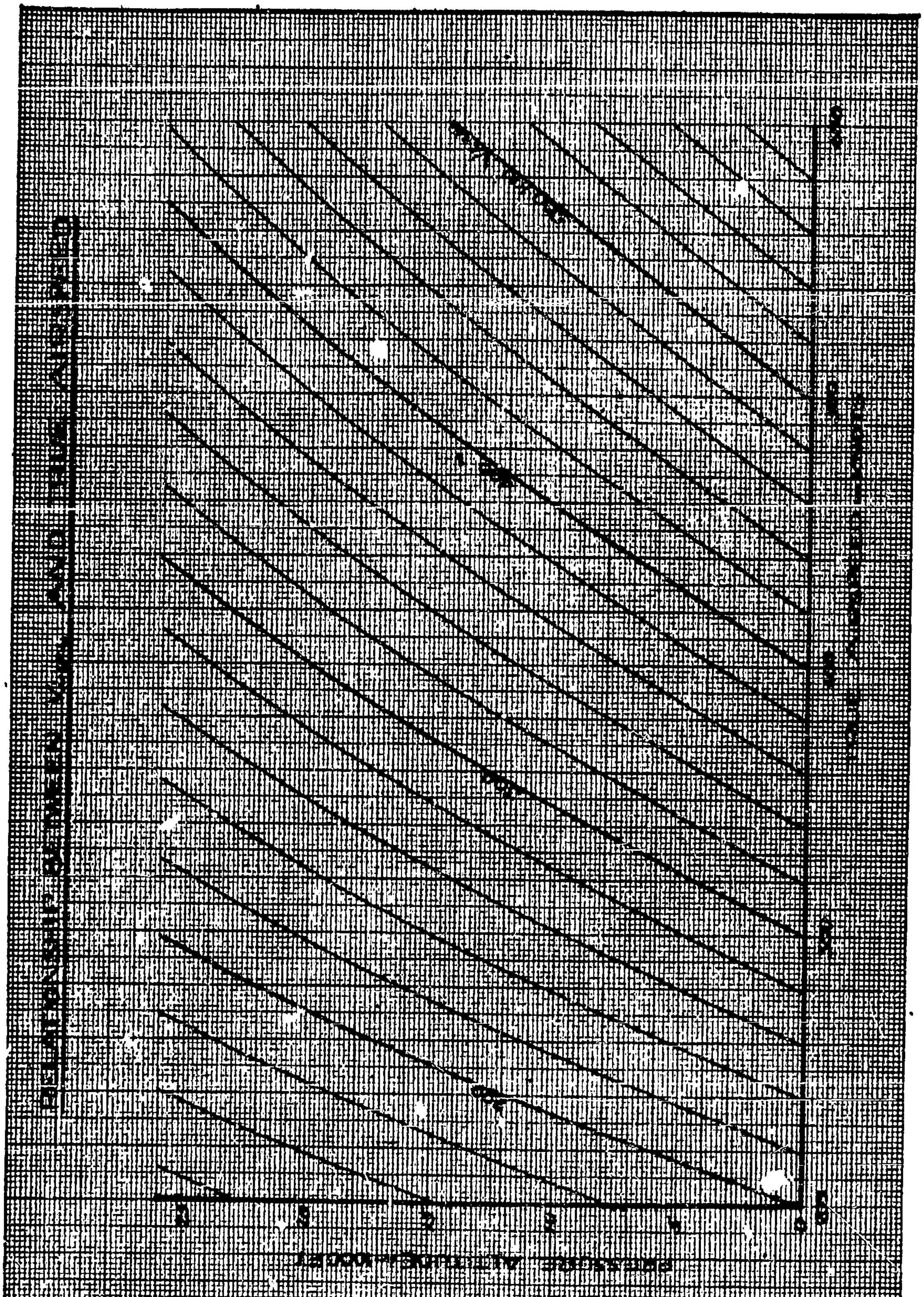


Figure #8

RELATED TESTS

1. APG/TAT/52-A-2, "Operational Suitability Test of the A-4 Gun-Bomb-Rocket Sight Installed in the F-84G Aircraft."

2. APG/ADB/18-A-1, "Operational Suitability Test of the A-4 Gun-Bomb-Rocket Sight with AN/APG-30 Radar Ranging Installed in the F-86E Aircraft."

3. APG/TAT/47-AB, "Operational Suitability Test of E-74 Fire Bomb and E3R2 Incendiary Oil Mixer and Transfer Unit."

4. EO-555-705A, Letter Report on "Final Engineering Test of E-51 Fire Bomb."

5. Project APG/14914 —— 5, "Operational Suitability Test of the B-3 Fragmentation Bomb Racks."

6. APG/TAB/12-A, "Operational Suitability Test of the F-86A Airplane with the A-1C Gun-Bomb-Rocket Sight for Bombing and Rocket Firing."

7. Project #N-50-10 (Nellis AFB), Final Report of "Testing of Modified F-86 Aircraft for Rocket Firing."

8. APG/TAB/92-A, "Performance Test of Fighter Aircraft Equipped with M-10 Spray Tanks."

9. APG/TAT/45-A, "Suitability Test of EX-10, 1000 Pound Low Drag Bomb."

10. APG/TAB/26-A, "Operational Suitability Test of Landing Mats as Runways for Jet Aircraft."

11. APG/TAT/89-A, "Operational Suitability Test of the 2.75 Inch Folding Fin Aircraft Rocket and the Century Expendable Launcher."

12. APG/TAB/36-A-2, "Pre-Combat Test of the 8 CM Rocket Installation on the F-84E (Phase II)."

13. APG/SAB/59-A, "Operational Suitability Test of Modified B-1 Kidde Automatic Gun Charger for Caliber .50 M-3 Machine Gun Installed in Upper Forward Turret of B-50D Aircraft."

14. APG/TAB/36-A-3. Final Letter Report on "Combat Suitability of the Oerlikon 8 CM Rocket on the F-84E (SWATROCK)."

15. Project No. 2492------5, "Operational Suitability Test of Light Weight Automatic-Pneumatic Gun Charger for Caliber .50 M-3 Machine Gun."

16. Project No. APG/ADA/61-A, "Project Feather Weight" (Classification TOP SECRET).

TEST PROCEDURES AND RESULTS

CRUISE CONTROL AND TAKE-OFF DISTANCES

1. Ordnance Delivery:

a. General: All ground attack missions were flown against fixed ground targets and data were recorded of impact, dive angles, slant ranges, and aircraft altitude by ground measurements and sight reticle cameras. Airspeeds, aircraft handling characteristics and other pertinent data were obtained from pilot interrogation.

b. Air-to-Ground Gunnery:

(1) Procedure: Missions were flown against the ground target from dive angles of approximately 30 and 60 degrees and at airspeeds ranging from 350 knots to 525 knots. Dives were made with and without the use of dive brakes with the guns fired at a slant range of 2500 to 800 feet.

(2) Results: The maximum hits obtained on the target were 52% of the rounds fired and several missions failed to obtain a hit. A review of the sight reticle film and interrogation of the pilots indicates the optimum attacking speed to be between 400 and 450 knots; at speeds above 500 knots minor corrections in sighting errors are very difficult to make. The results also indicate that violent break-offs should not be attempted because of the tendency of the aircraft to porpoise and become uncontrollable.

c. Rocketry:

(1) Procedure:

(a) Five (5) inch HVA Rockets were fired against a fixed ground target using an entry altitude of approximately 10,000 feet with a standard 90 degree side approach. The standard sight setting for the A-4 GBR Sight was reduced from 4.2 seconds

to 1.5 seconds and the depression angle was reduced from 51 mils to 20 mils in the "normal" setting and by a proportional amount in the "steep" setting (Ref. Proj. No. APG/TAB/52-A-2). Attacks were made with the sight set in the "steep" and "normal" position, with and without the use of dive brakes. The rockets were fired from an average slant range of 4150 feet for the "steep" setting and 3600 feet for the "normal" setting; the average airspeed at the fire point was between 400 and 425 knots.

(b) 8 CM rockets and 2.75-inch FFAR Century Expendable Launchers were ground and air fired with external stores attached to the aircraft to determine if these rockets could be launched satisfactorily from the aircraft when carrying external stores.

(2) Results:

(a) Forty (40) five-inch HVA rockets were fired at the target and scored with the sight set in one of the two functions for the 5" HVA rockets. Sixteen (16) releases were made in a thirty (30) degree dive with the sight set for 5" HVA rockets "normal"; the remaining rockets were fired from about forty-five (45) degree dive with the sight set for 5" HVA rockets "steep". The impact of each rocket is shown in Figures 1 and 2.

(b) The 8 CM and 2.75-inch FFAR Century Expendable Launchers were fired successfully from the F-86F without adverse affect to the aircraft or external stores.

(c) 5" HVA rockets fired from an F-84G are shown in Figure 3.

d. Fixed Sight Dive Bombing:

(1) Procedure: Dive bombing missions were flown at fixed ground targets using 100, 500, and 1000-pound bombs. Attacks were made on the target from a ninety (90) degree side approach at approximately 10,000 feet in

dives from forty-five (45) to fifty-five (55) degrees with dive brakes extended. The airspeed at entry into the dive was approximately 200 knots with the throttle in the idle position and the dive brakes extended. Single releases were made manually at an altitude of approximately 2,900 feet.

(2) Results: Twenty (20) bombs were dropped and scored with the pilot releasing the bombs manually. The impact of each bomb is shown in Figure 4. A review of the impacts indicates a circular error of 55 mils with the mean point of impact being 1,000 feet short and 150 feet to the left of the target.

e. Manual Pip Control Dive Bombing:

(1) Procedure: Forty-seven (47) bombs were dropped against a fixed ground target using the MPC method of attacking a target (see Appendix B). The target was attacked with 100, 500, and 1000-pound bombs from dive angles of 30, 50, and 70 degrees with the average release altitudes being 3500, 5000, and 7500 feet respectively, above the selected target altitude.

(2) Results: The results obtained from the different dive angles are presented in Figures 5, 6, and 7. A review of these figures indicates that practically all the impacts were short of the target with the circular error probable being 51, 43, and 34 mils for the 30, 50, and 70 degree dives respectively. An inspection of the impacts shows that only one bomb would have destroyed a target the size of a tank (Figure 6). Results of dive bombing (Automatic Release) taken from the Operational Suitability Test of the A-4 Sight are shown in Figure 8.

2. Aircraft Performance:

a. Take-off Distances:

(1) Procedure: Take-off distances and the distances to clear a fifty (50) foot obstacle for various external loads of the aircraft were measured by means of a

ground phototheodolite located a known distance from the runway. All take-offs were made from a concrete surface and an engine power setting of 90%. The 90% power setting was used in lieu of 100% to simulate formation take-offs. Mat take-off distances were not made due to the unavailability of a mat runway, however, mat take-off distances were obtained by multiplying the concrete distances by a factor of 1.2 (APG/TAB/26-A).

(2) Results: The results are presented in Figures 9 thru 27.

b. Climb:

(1) Procedure: Climb data for various external loads were obtained by employing the "energy" climb method (AF Technical Report #6273) of determining rates of climb and airspeeds for best rate of climb. Surveys were made at 1,000, 10,000, 25,000, 35,000, 40,000 and 45,000 feet. Check climbs were made to substantiate the results of the "energy" data and also to record fuel consumptions during climbs. All climbs were made at 90% power.

(2) Results: The results obtained are presented in Figures 9 thru 27.

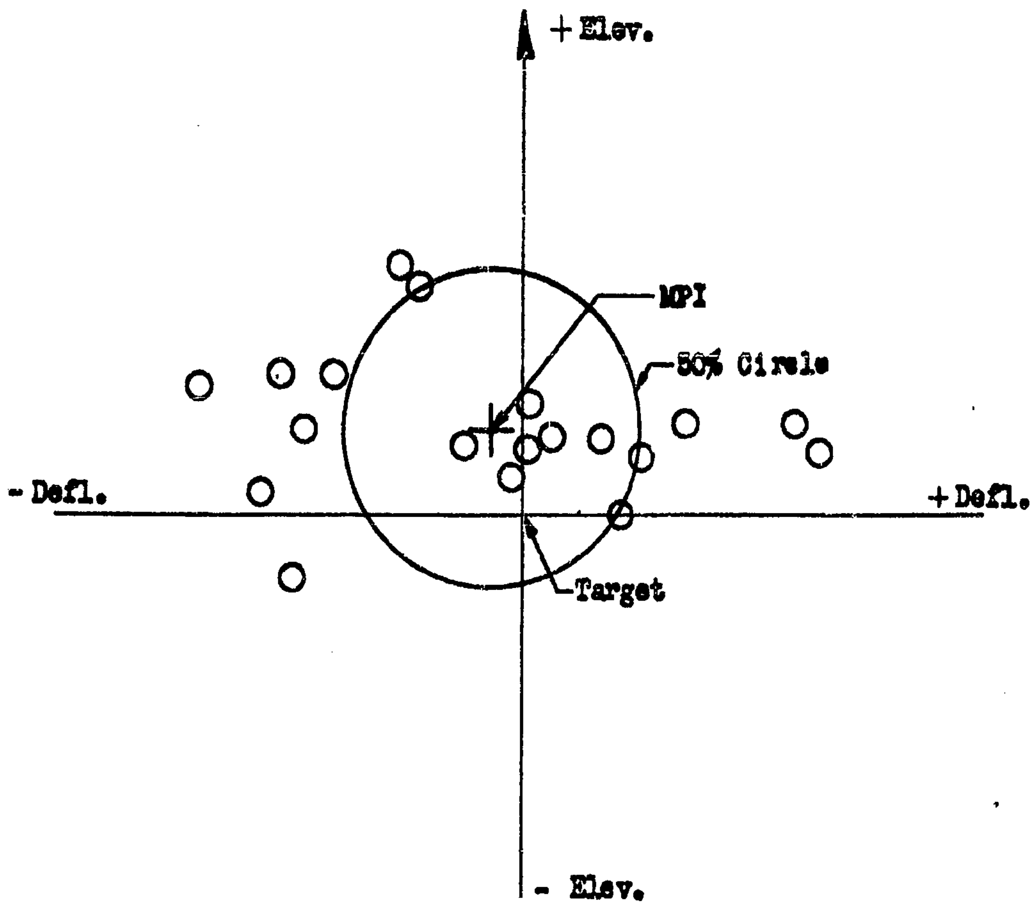
c. Cruise Control:

(1) Procedure: Fuel consumption for various altitudes and airspeeds was measured for different external loads of the aircraft. These data were reduced and the optimum cruise airspeeds and power settings were determined and actual radius of action missions were flown to substantiate the calculated cruise control. The ordnance carried on these missions was expended at the maximum radius point in a simulated combat attack against tactical ground targets.

(2) Results: The results are presented in the form of mission profiles shown in Figures 9 thru 27.

5"HVA ROCKETS FIRED AIR TO GROUND FROM F-86F FIGHTER AIRCRAFT

Note: Impacts as shown are in plane normal to rocket trajectory and corrected to axis of sight



	Elev.	Def.
MPI:	8.61	-3.82

Radius 50% circle: 15.7 Mils
Total no. rockets: 19

Average dive angle: 28°
Average slant range: 3600'

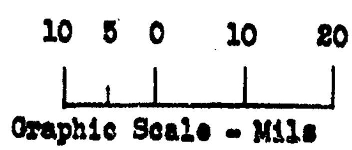
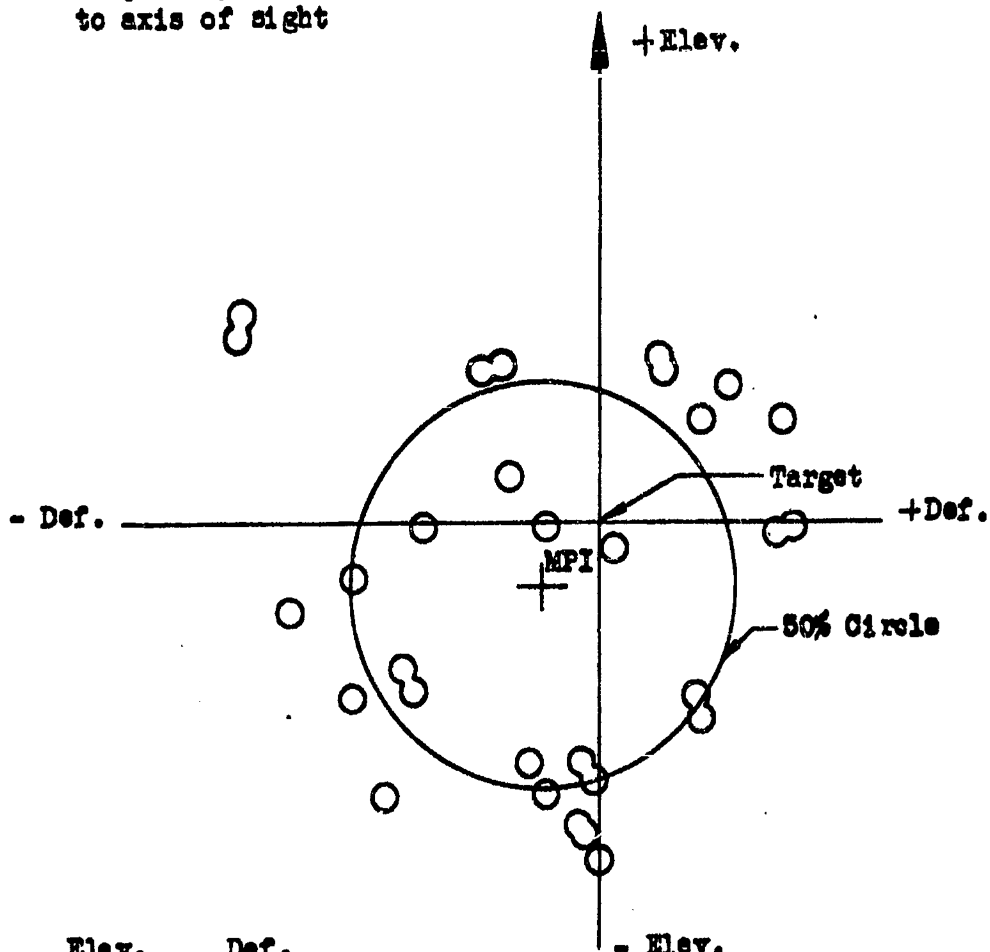


FIGURE #1

5" HVA ROCKETS FIRED AIR TO GROUND FROM F-86F FIGHTER AIRCRAFT

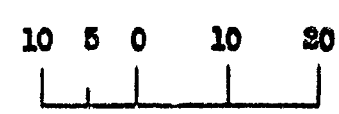
Note: Impacts as shown are in plane normal to rocket trajectory and corrected to axis of sight



	Elev.	Def.
MPI:	-6.28	-6.00

Radius of 50% circle: 20 mils
Total no. rockets: 30

Average dive angle: 36°
Average slant range: 4150'

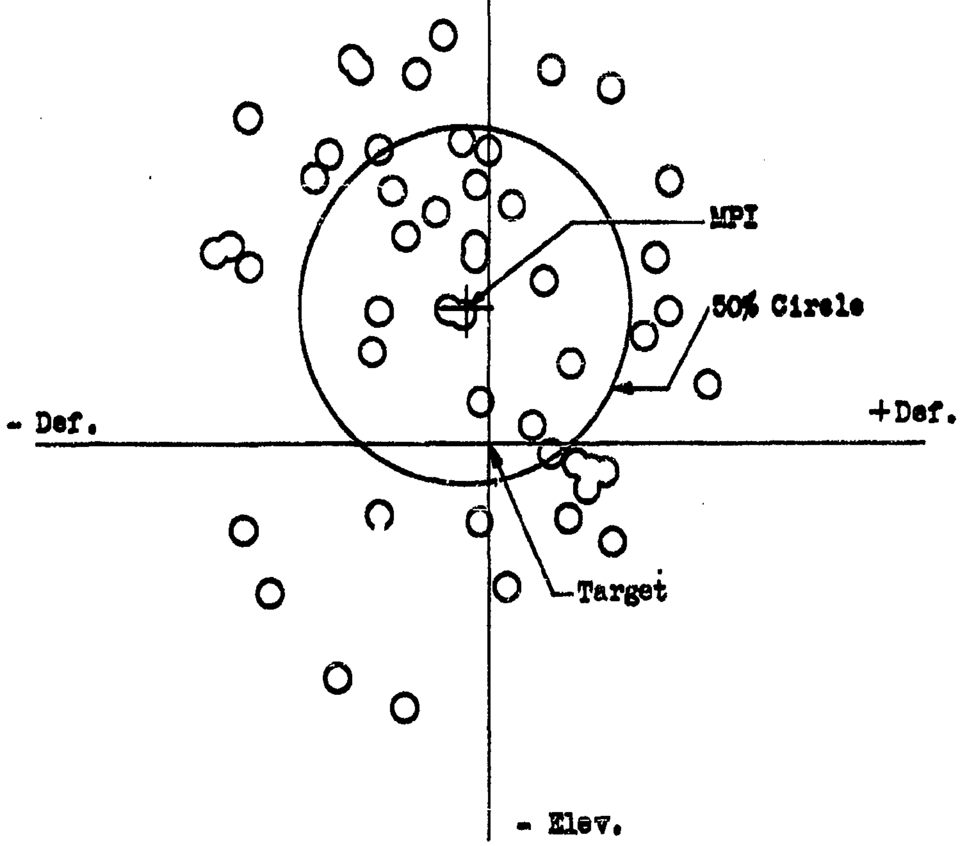


Graphic Scale - Mils

FIGURE #2

5"HVA ROCKETS FIRED AIR TO GROUND FROM F-84G FIGHTER AIRCRAFT

Note: Impacts as shown are in plane normal to rocket trajectory and corrected to axis of sight (Extracted from APGC final rept. APG/TAT/52A-2)



	Elev.	Def.
MPI:	13.12	-2.65

Radius 50% circle: 18.31 Mils
Total rockets: 49

Average dive angle: 38°
Average slant range: 3690'

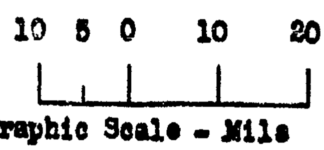


FIGURE #3

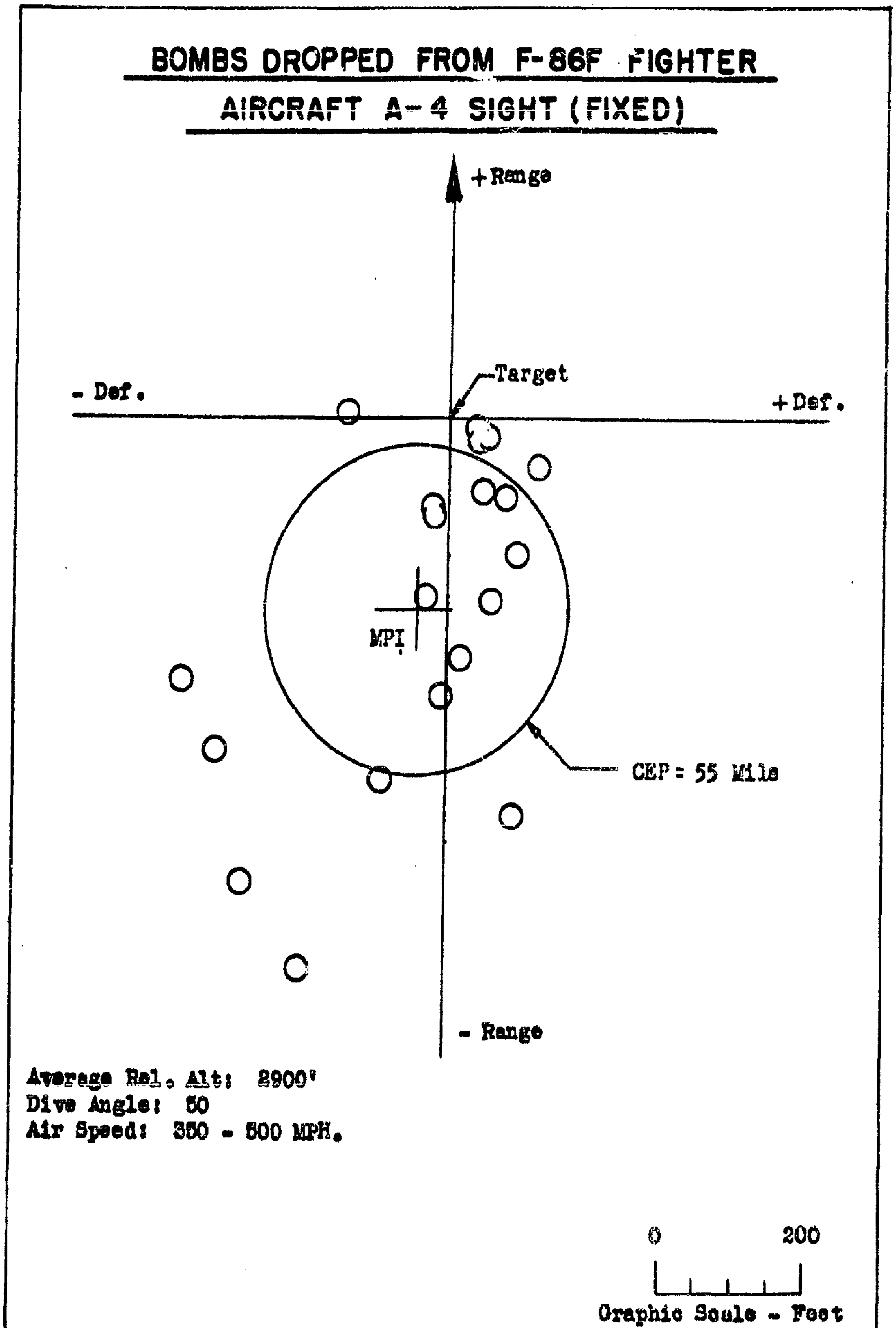

BOMBS DROPPED FROM F-86F FIGHTER
AIRCRAFT A-4 SIGHT (FIXED)
+Range
Target
- Def.
+Def.
MPI
CEP = 55 Mils
- Range
Average Rel. Alt: 2900'
Dive Angle: 50
Air Speed: 350 - 500 MPH.
0
200
Graphic Scale - Feet

FIGURE #4

BOMBS DROPPED FROM F-86F FIGHTER AIRCRAFT MANUAL PIP CONTROL SYSTEM

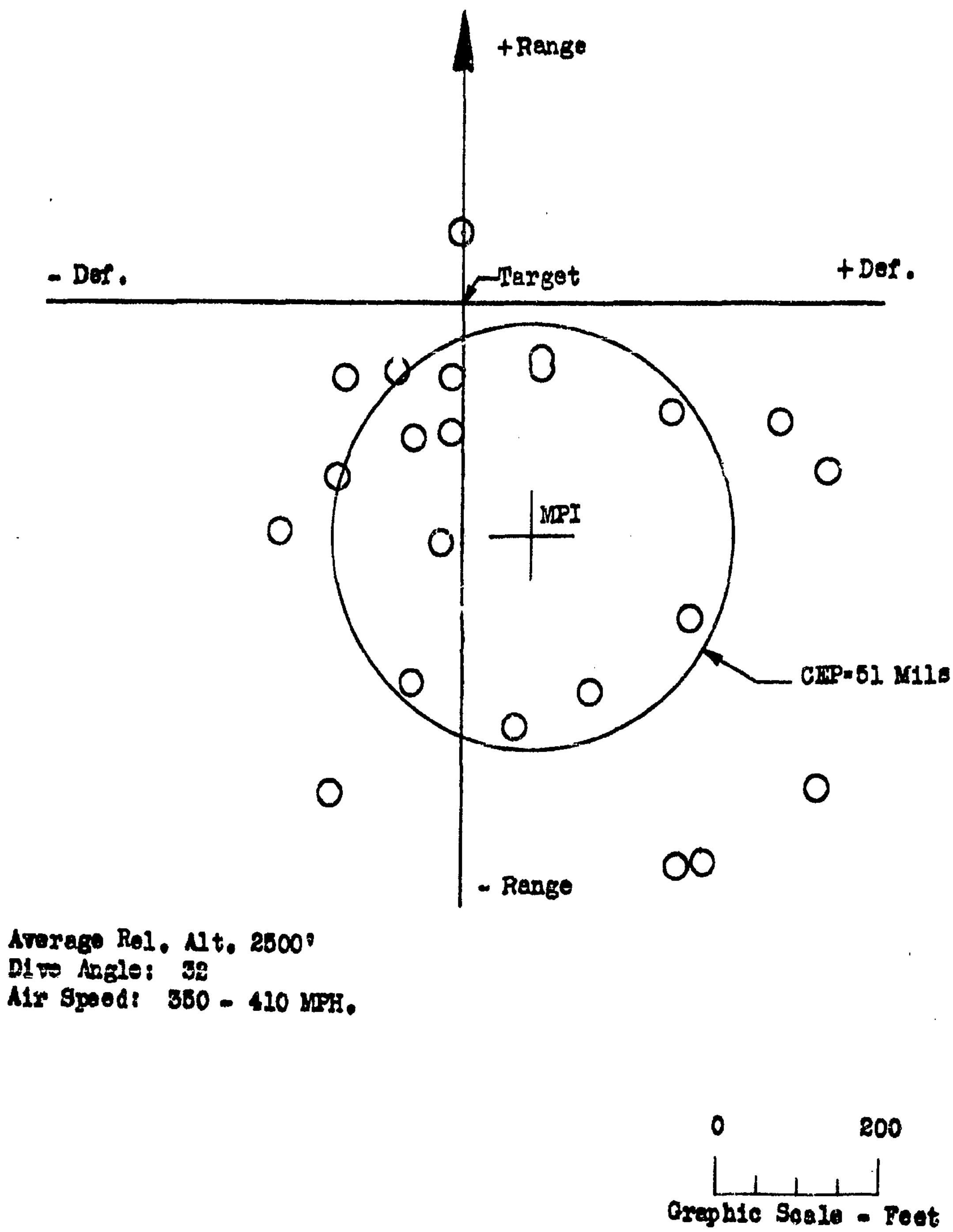


FIGURE #5

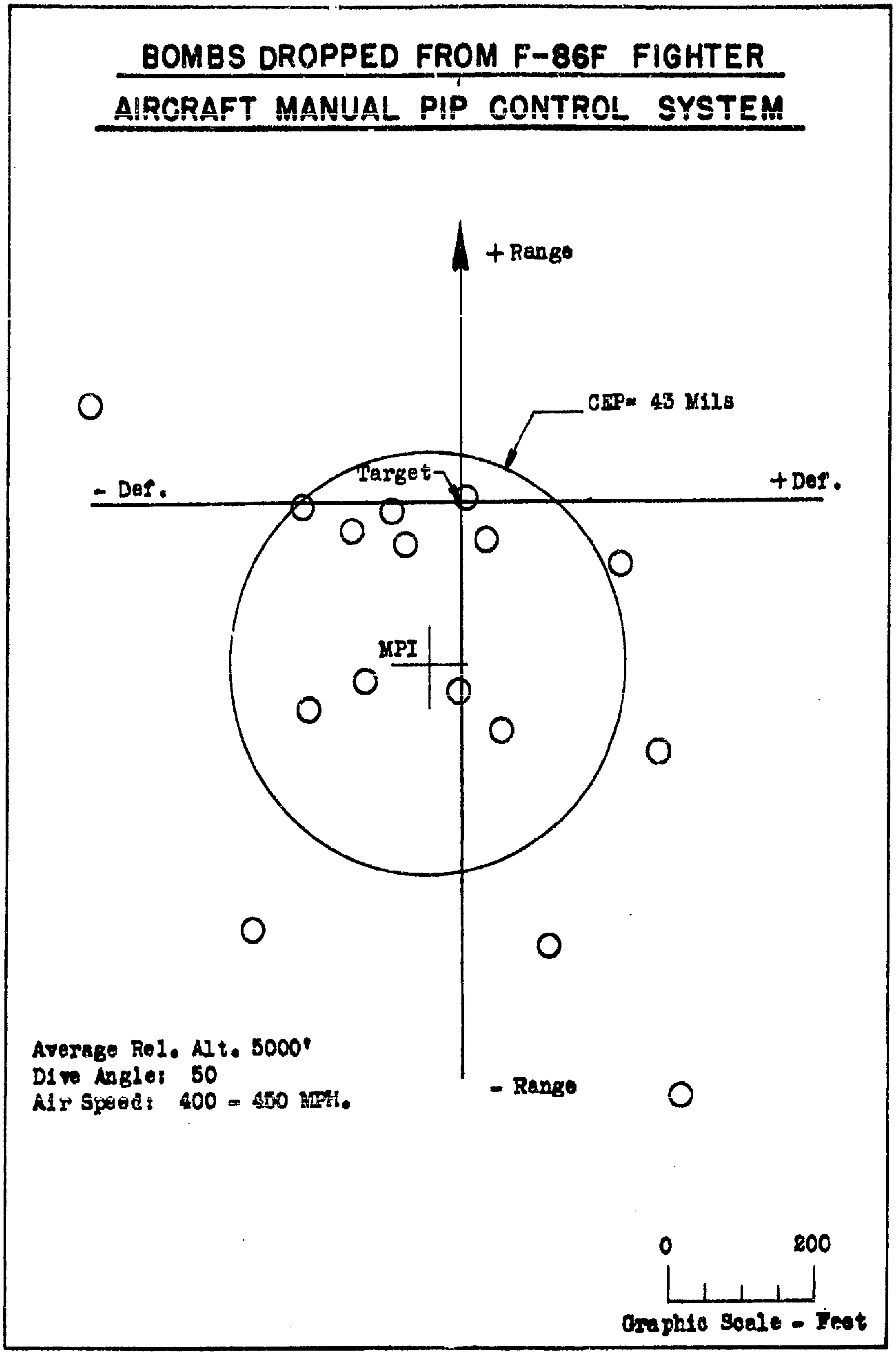

BOMBS DROPPED FROM F-86F FIGHTER
AIRCRAFT MANUAL PIP CONTROL SYSTEM
+ Range
CEP= 43 Mils
Target
- Def.
+ Def.
MPI
Average Rel. Alt. 5000'
Dive Angle: 50
Air Speed: 400 - 450 MPH.
- Range
0
200
Graphic Scale - Feet

FIGURE #6

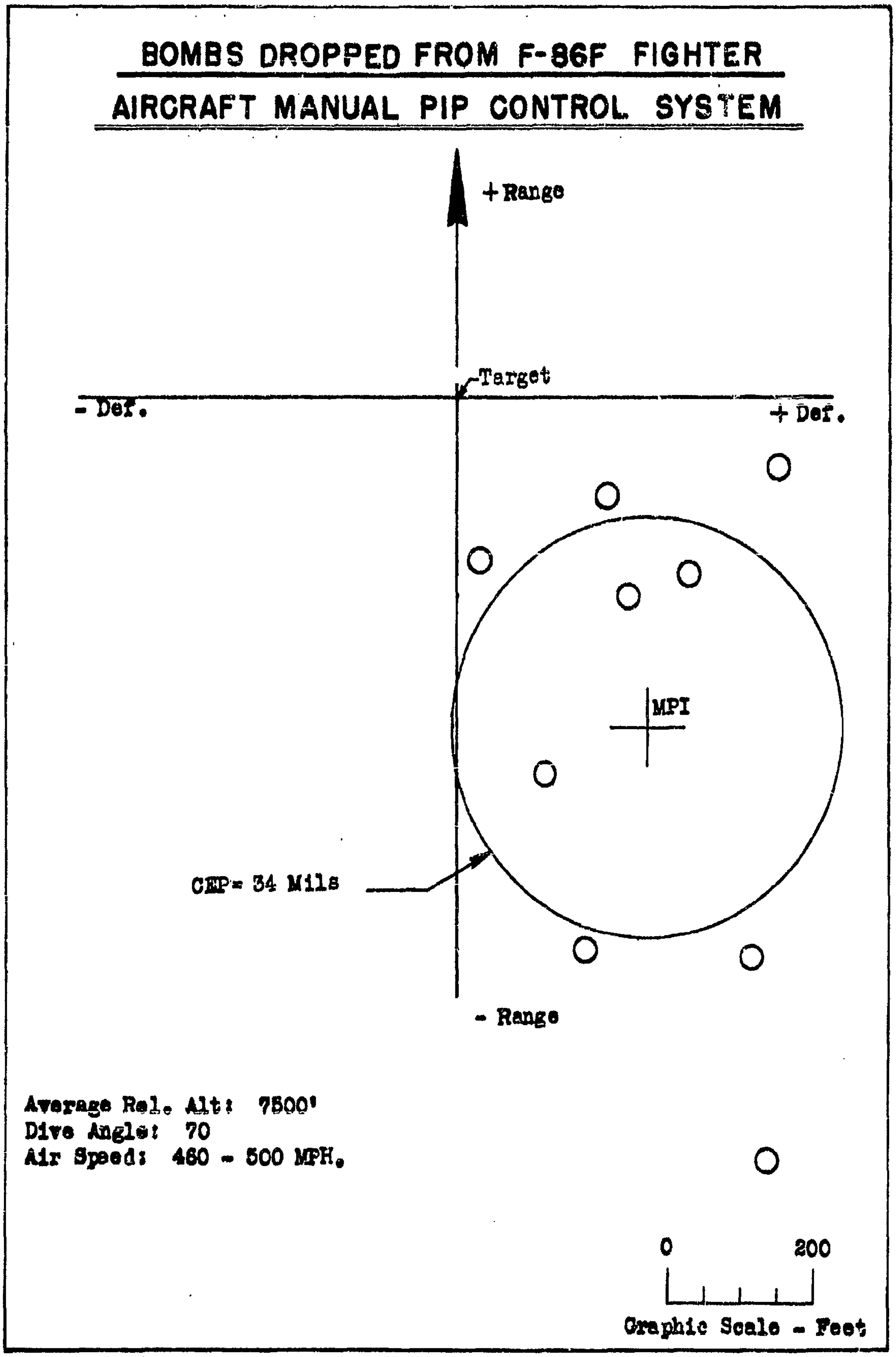

BOMBS DROPPED FROM F-86F FIGHTER
AIRCRAFT MANUAL PIP CONTROL SYSTEM
+ Range
Target
- Def.
+ Def.
MPI
CEP = 34 Mils
- Range
Average Rel. Alt: 7500'
Dive Angle: 70
Air Speed: 460 - 500 MPH.
0
200
Graphic Scale - Feet

FIGURE #7

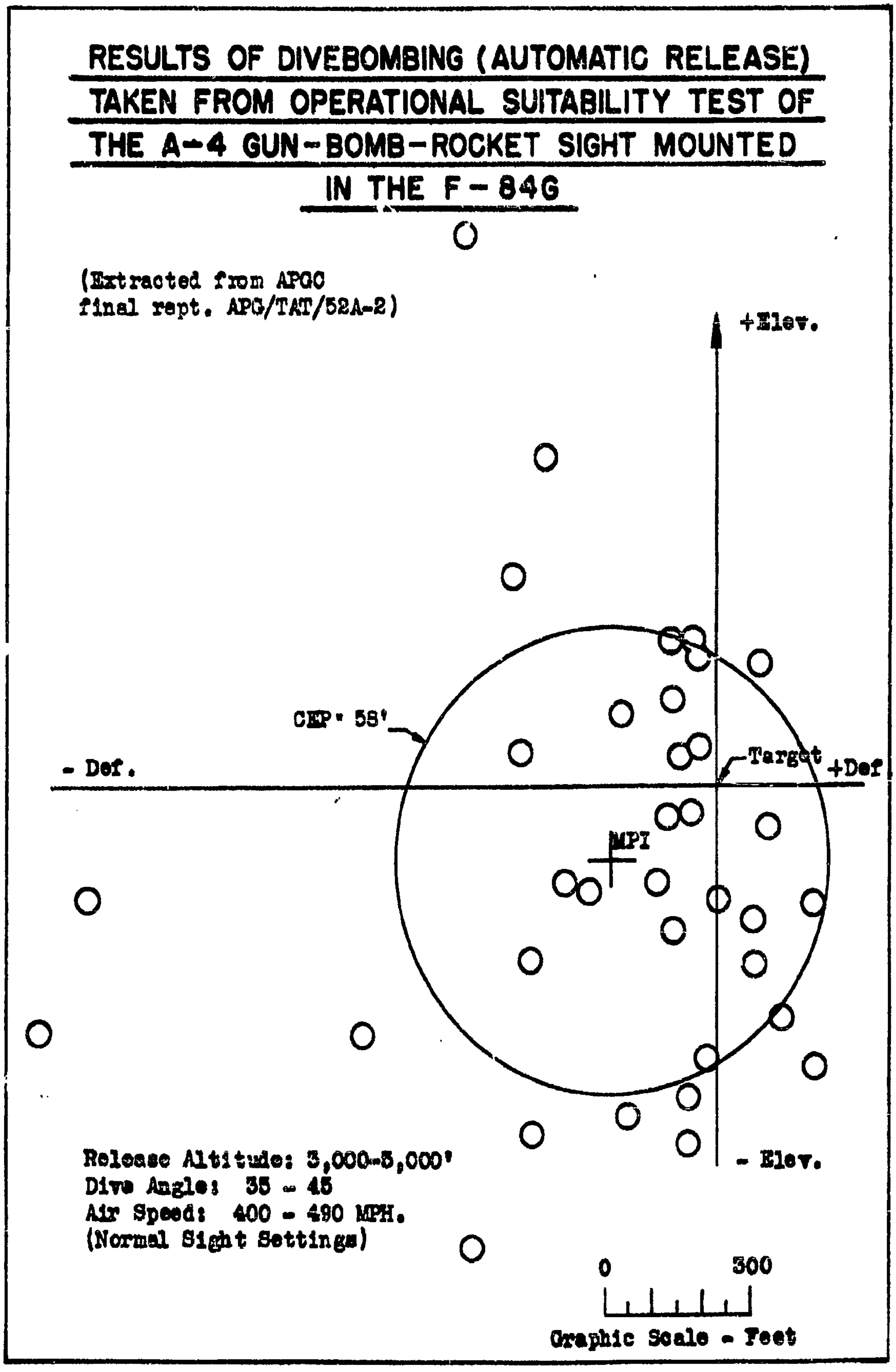
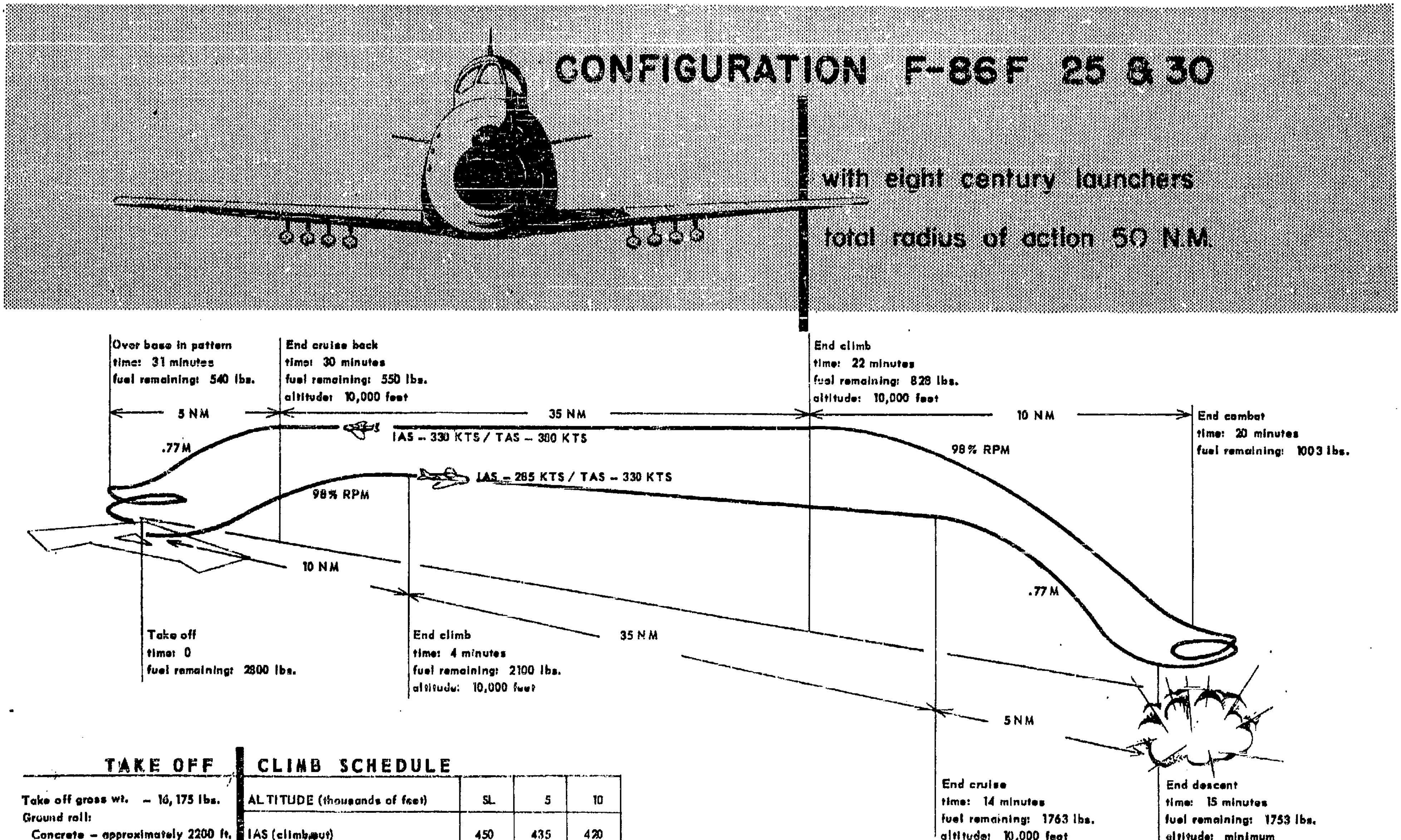

RESULTS OF DIVEBOMBING (AUTOMATIC RELEASE)
TAKEN FROM OPERATIONAL SUITABILITY TEST OF
THE A-4 GUN-BOMB-ROCKET SIGHT MOUNTED
IN THE F-84G
(Extracted from APGC
final rept. APG/TAT/52A-2)
+Elev.
CEP = 58'
- Def.
Target
+Def
MPI
- Elev.
Release Altitude: 3,000-5,000'
Dive Angle: 35 - 45
Air Speed: 400 - 490 MPH.
(Normal Sight Settings)
0
300
Graphic Scale - Feet

FIGURE #8



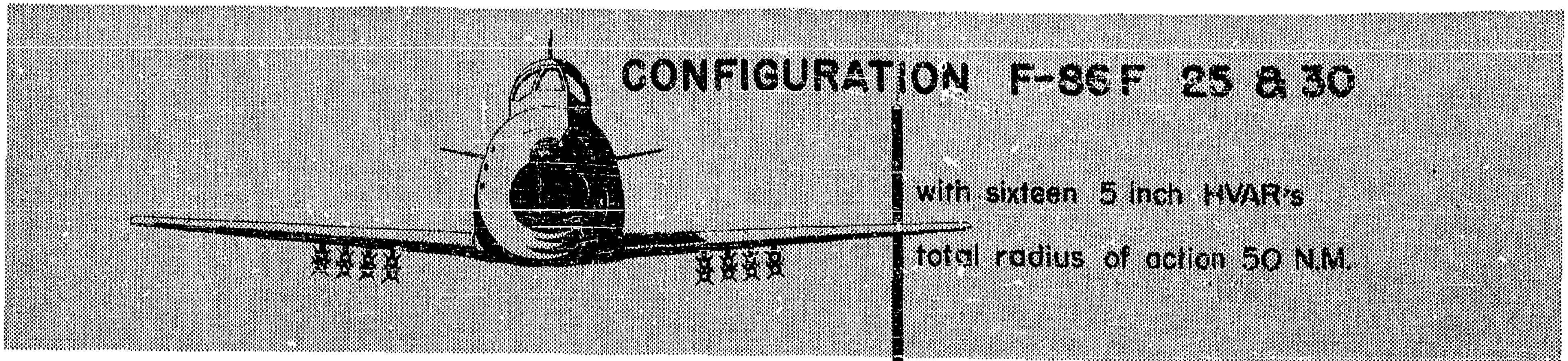
TAKE OFF

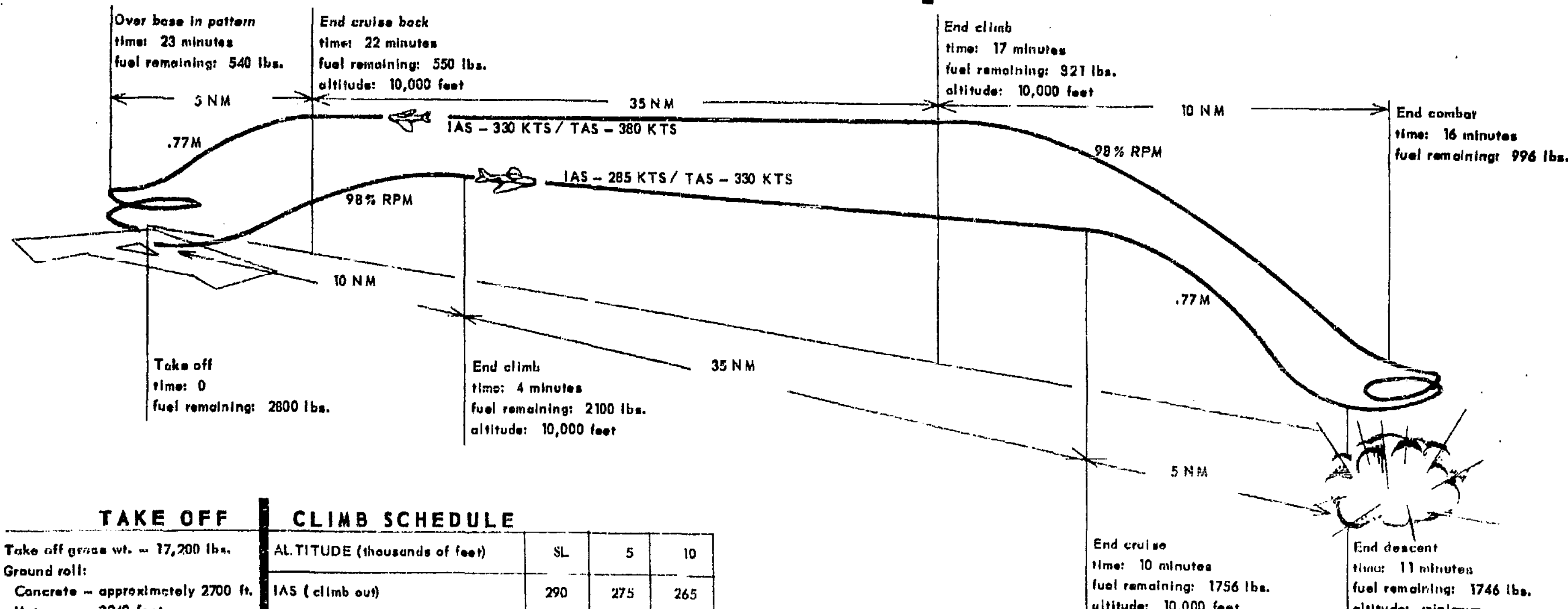
Take off gross wt. – 16,175 lbs.
Ground roll:
Concrete – approximately 2200 ft.
Mat – 2640 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10
IAS (climbout)	450	435	420
IAS (climb back)		460	430

FIGURE #9





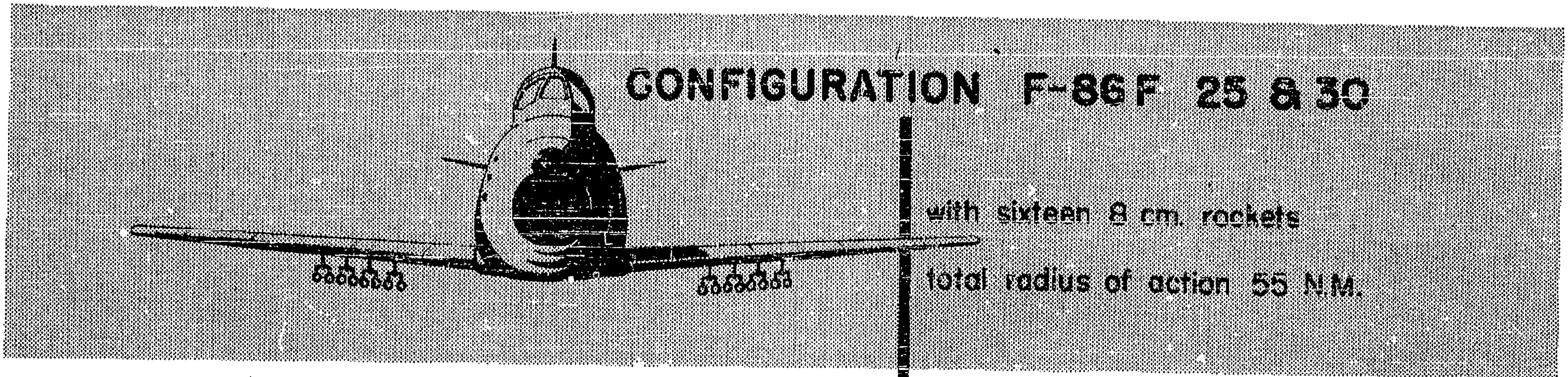
TAKE OFF

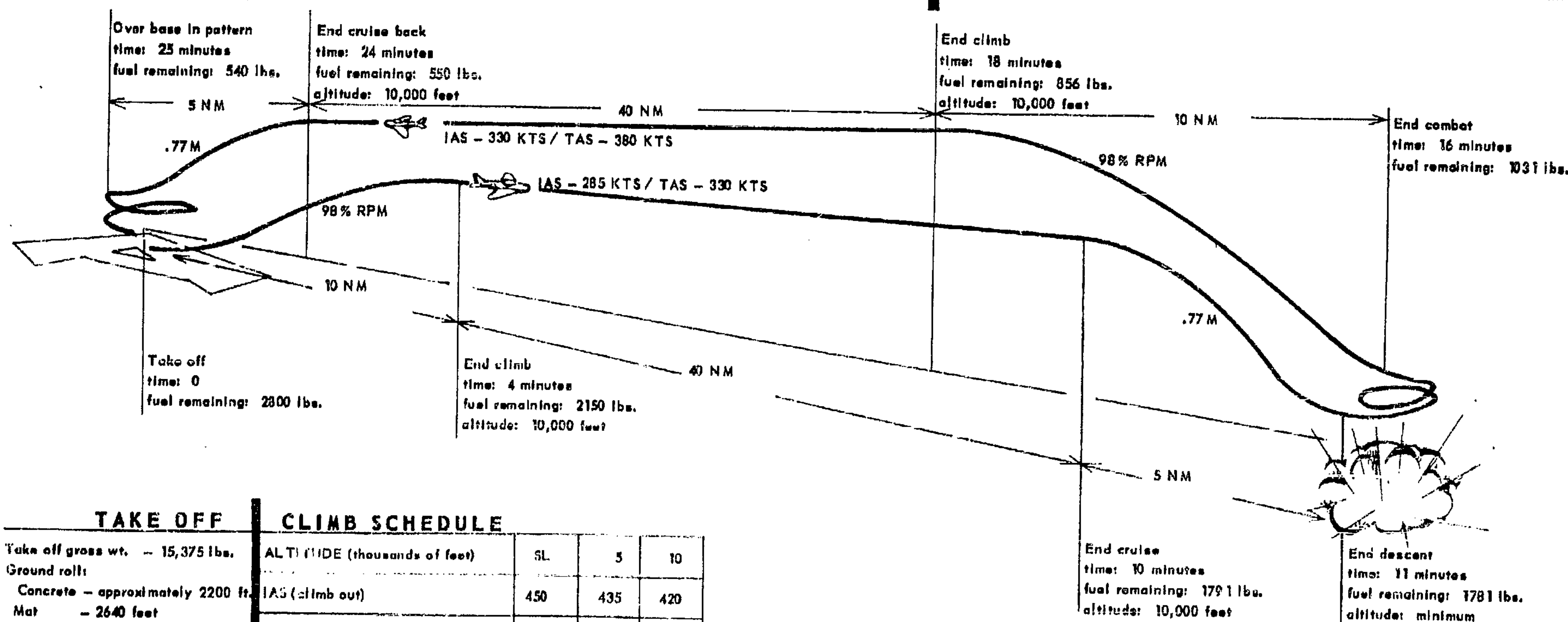
Take off gross wt. – 17,200 lbs.
Ground roll:
Concrete – approximately 2700 ft.
Mat – 3240 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10
IAS (climb out)	290	275	265
IAS (climb back)		460	430

FIGURE #10





TAKE OFF

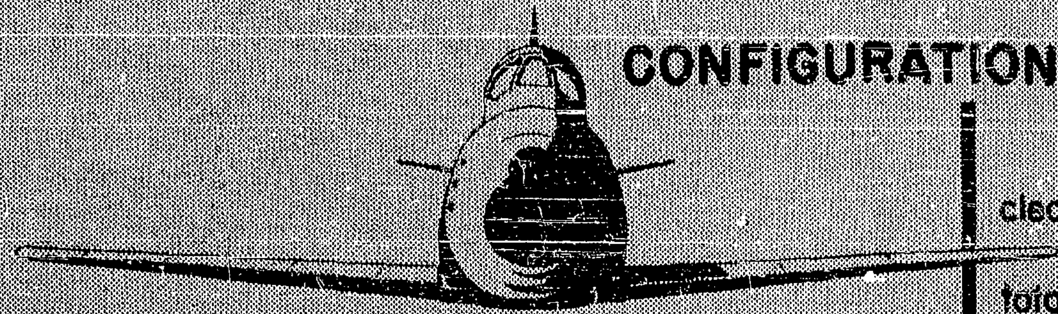
Take off gross wt. – 15,375 lbs.
Ground roll:
Concrete – approximately 2200 ft.
Mat – 2640 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10
IAS (climb out)	450	435	420
IAS (climb back)		460	430

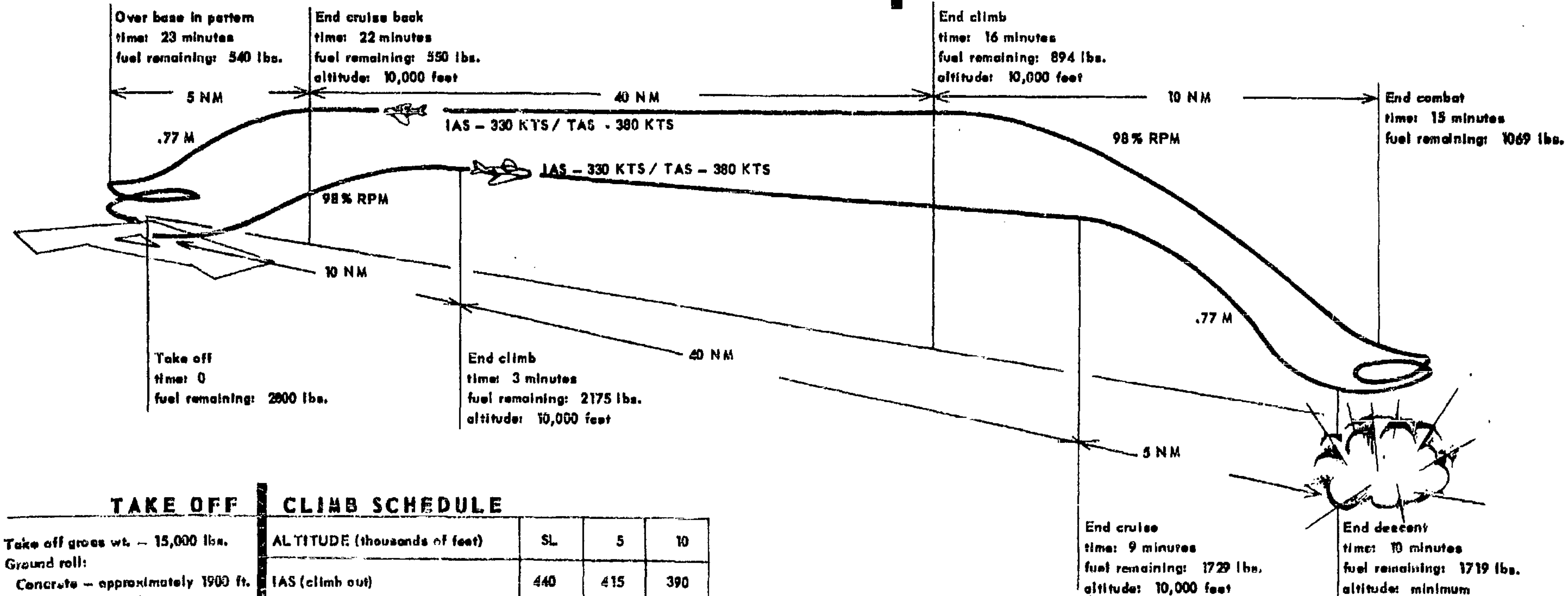
FIGURE #12

CONFIGURATION F-86F 25 & 30



clean

total radius of action 55 N.M.



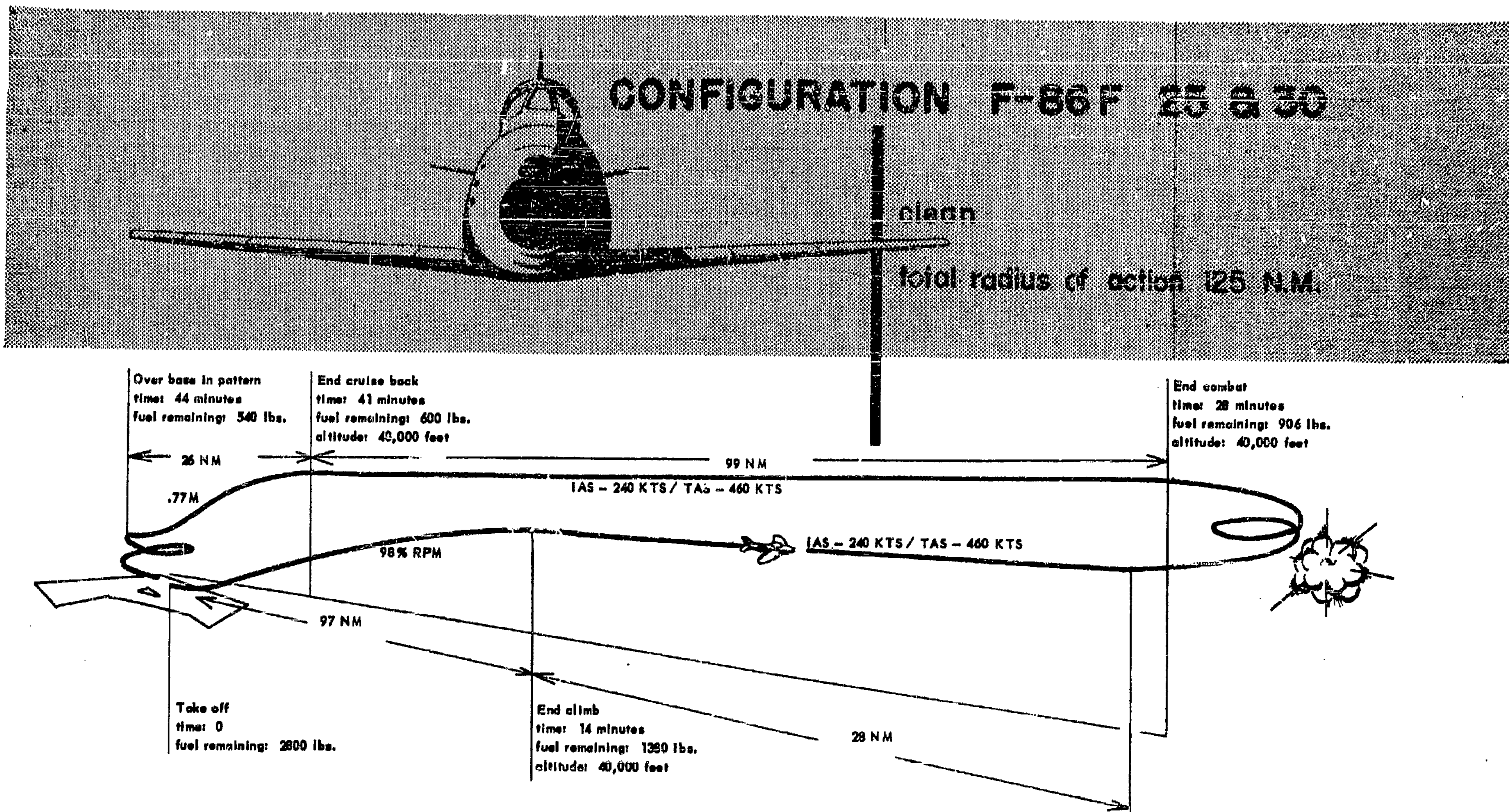
TAKE OFF

Take off gross wt. – 15,000 lbs.
Ground roll:
Concrete – approximately 1900 ft.
Mat – 2280 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10
IAS (climb out)	440	415	390
IAS (climb back)		415	390

FIGURE #13



TAKE OFF

Take off gross wt. – 15,000 lbs.
Ground roll:
Concrete – approximately 1900 ft.
Mat – 2280 feet

CLIMB SCHEDULE

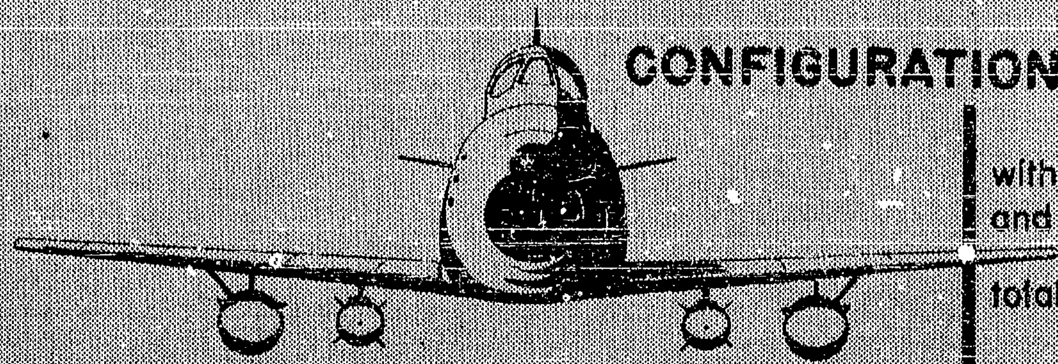
ALTITUDE (thousands of feet)	SL	5	10	15	20	25	30	35	40
IAS (climb out)	440	415	390	365	340	320	295	275	245

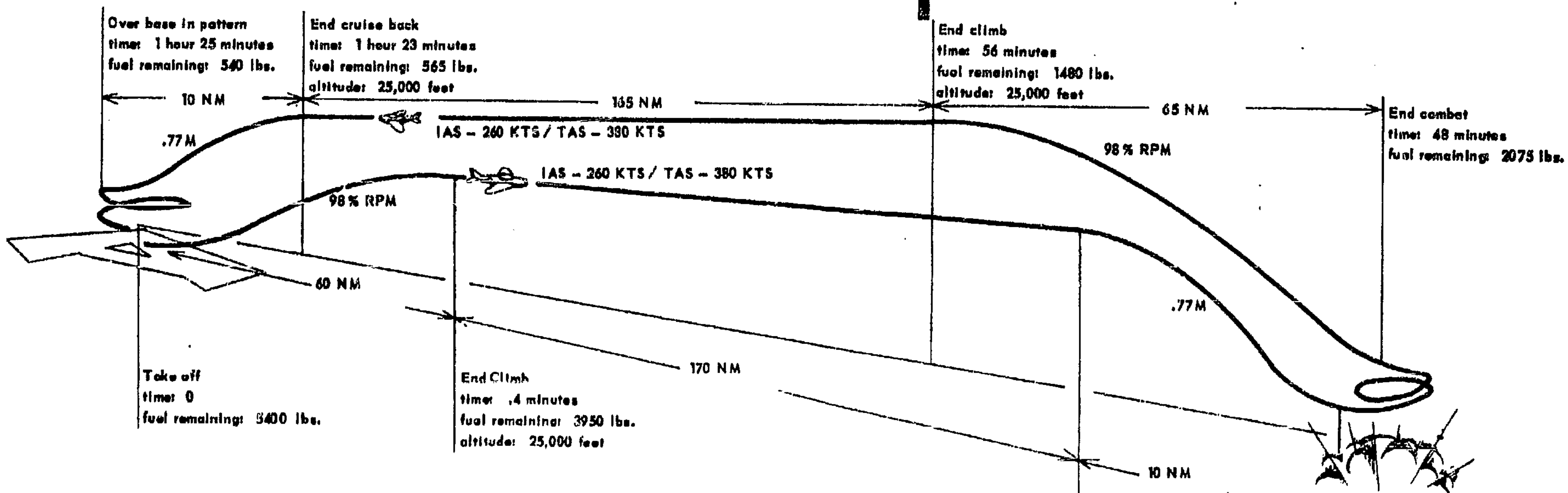
FIGURE #14

CONFIGURATION F-86F 25 & 30

with two 200 gallon tanks
and two 1000 lb. bombs

total radius of action 240 N.M.





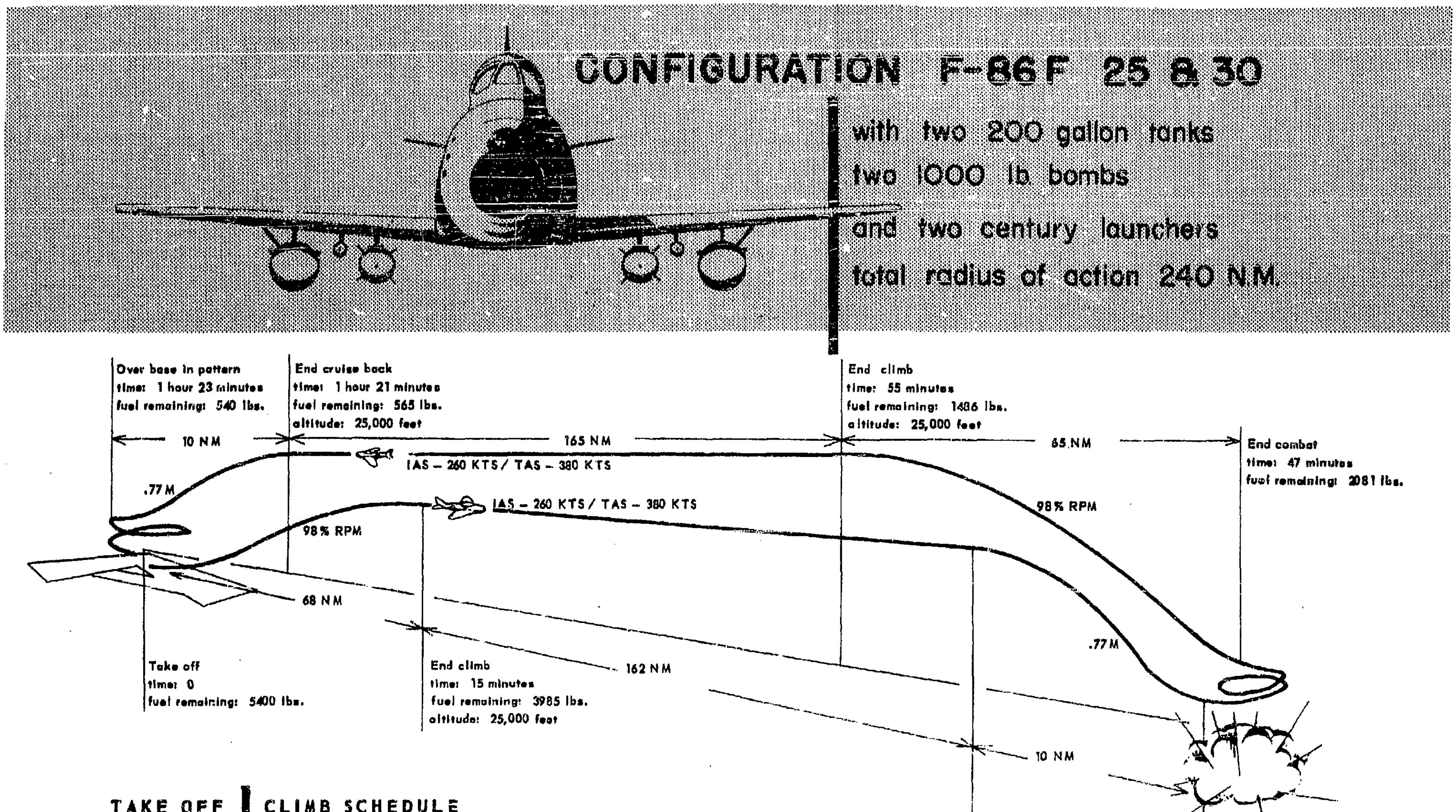
TAKE OFF

Take off gross wt. – 19,950 lbs.
Ground roll:
Concrete – 4210 feet
Mat – 5040 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	310	295	280	265	250	235
IAS (climb back)		390	370	345	320	295

FIGURE #15



TAKE OFF

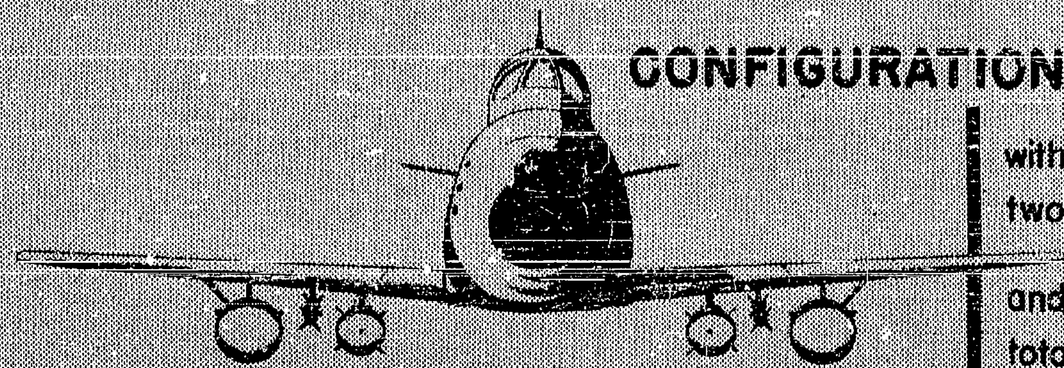
Take off gross wt. – 20,125 lbs.
Ground roll:
Concrete – 4240 feet
Mat – 5090 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	310	295	280	265	250	235
IAS (climb back)		390	370	345	320	295

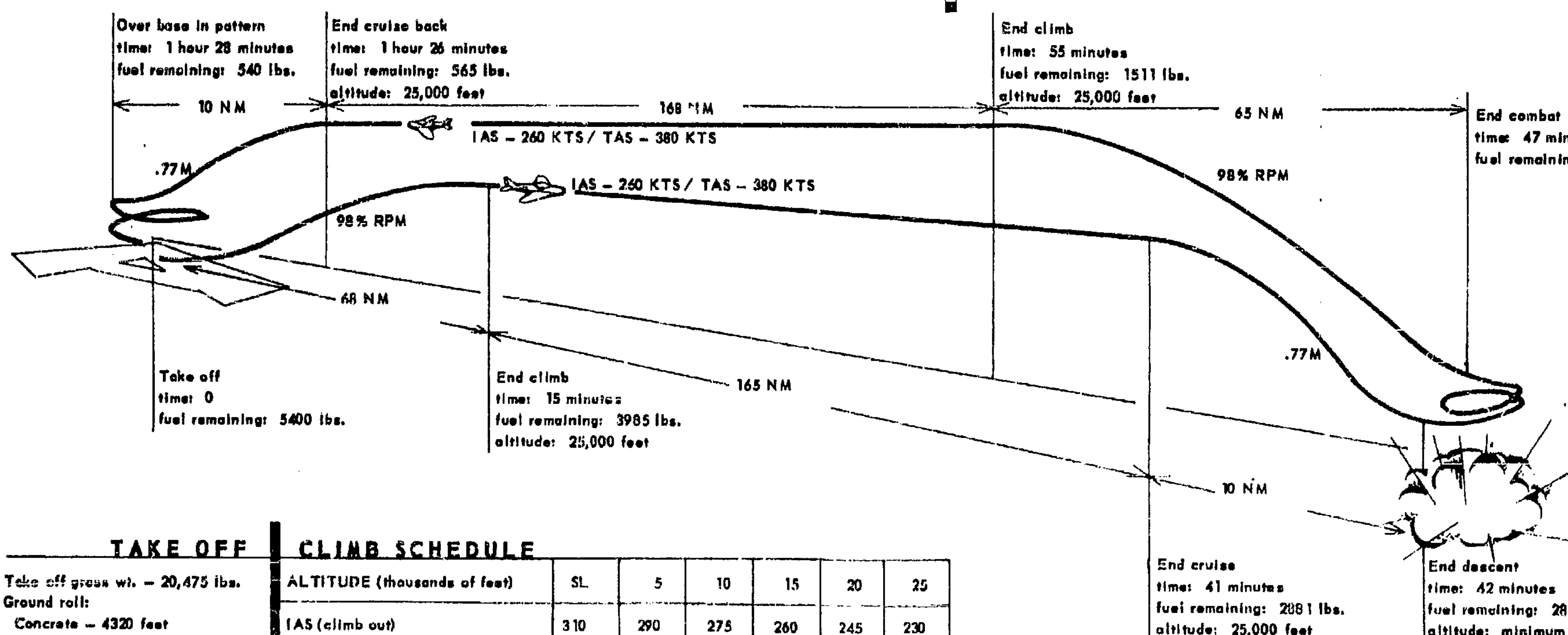
FIGURE #16

CONFIGURATION F-86F 25 & 30



with two 200 gallon tanks
two 1000 lb. bombs

and four 5 inch HVAR's
total radius of action 243 N.M.



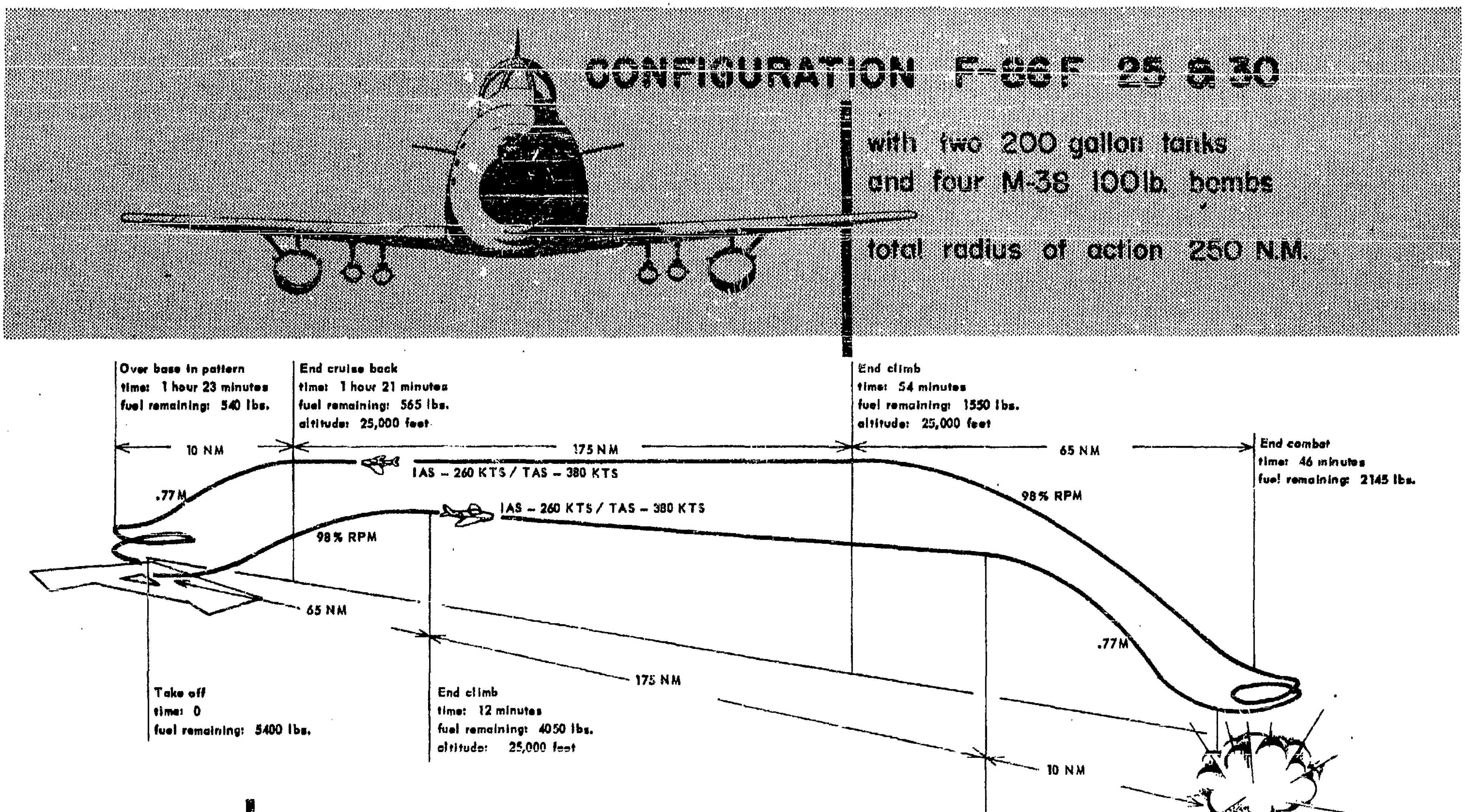
TAKE OFF

Take off gross wt. – 20,475 lbs.
Ground roll:
Concrete – 4320 feet
Mat – 5185 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	310	290	275	260	245	230
IAS (climb back)		390	370	345	320	295

FIGURE #17



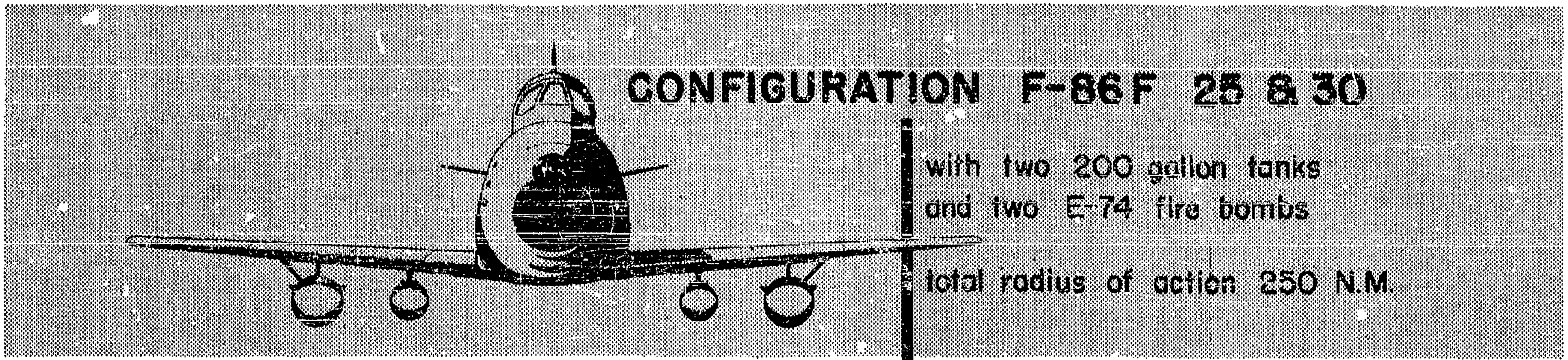
TAKE OFF

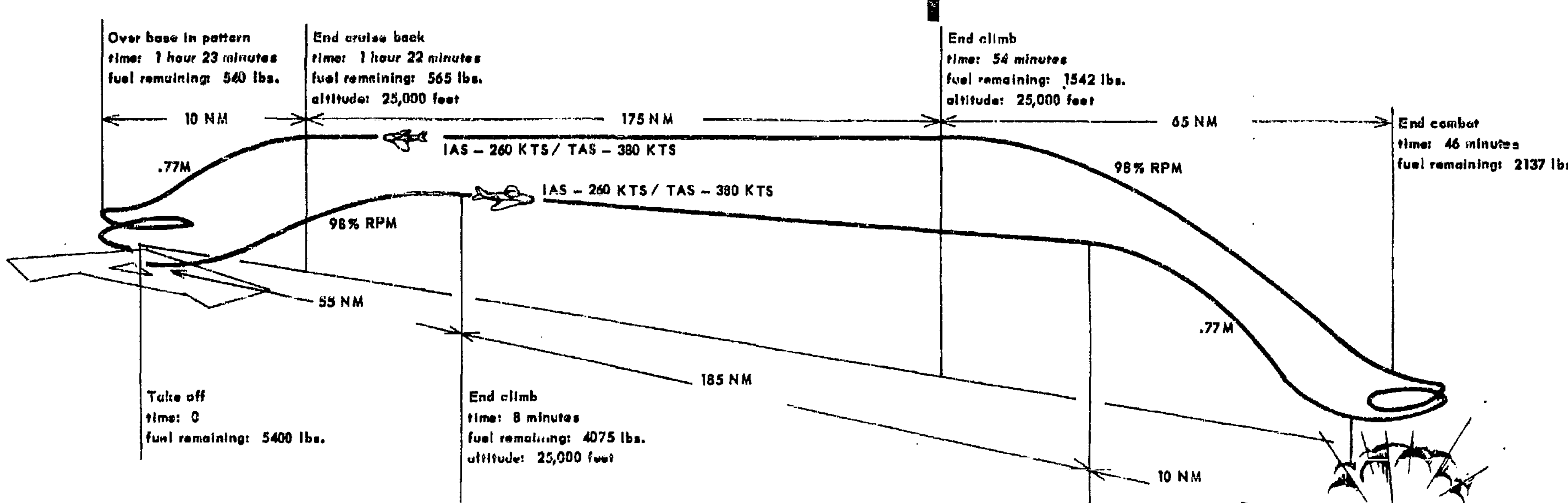
Take off gross wt. – 18,350 lbs.
Ground roll:
Concrete – 3840 feet
Mat – 4610 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	320	300	290	285	270	255
IAS (climb back)		390	370	345	320	295

FIGURE #18





TAKE OFF

Take off gross wt. – 19,450 lbs.

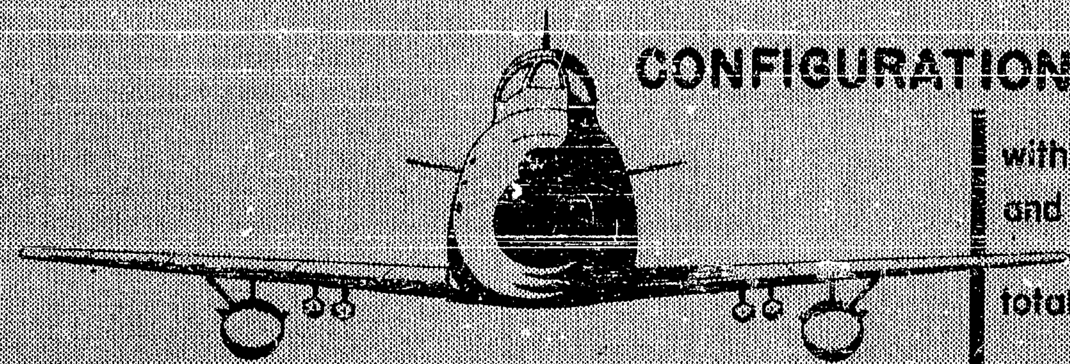
Ground roll:
Concrete – 4080 feet
Mat – 4900 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL.	5	10	15	20	25
IAS (climb out)	318	300	285	270	255	240
IAS (climb back)		390	370	345	320	295

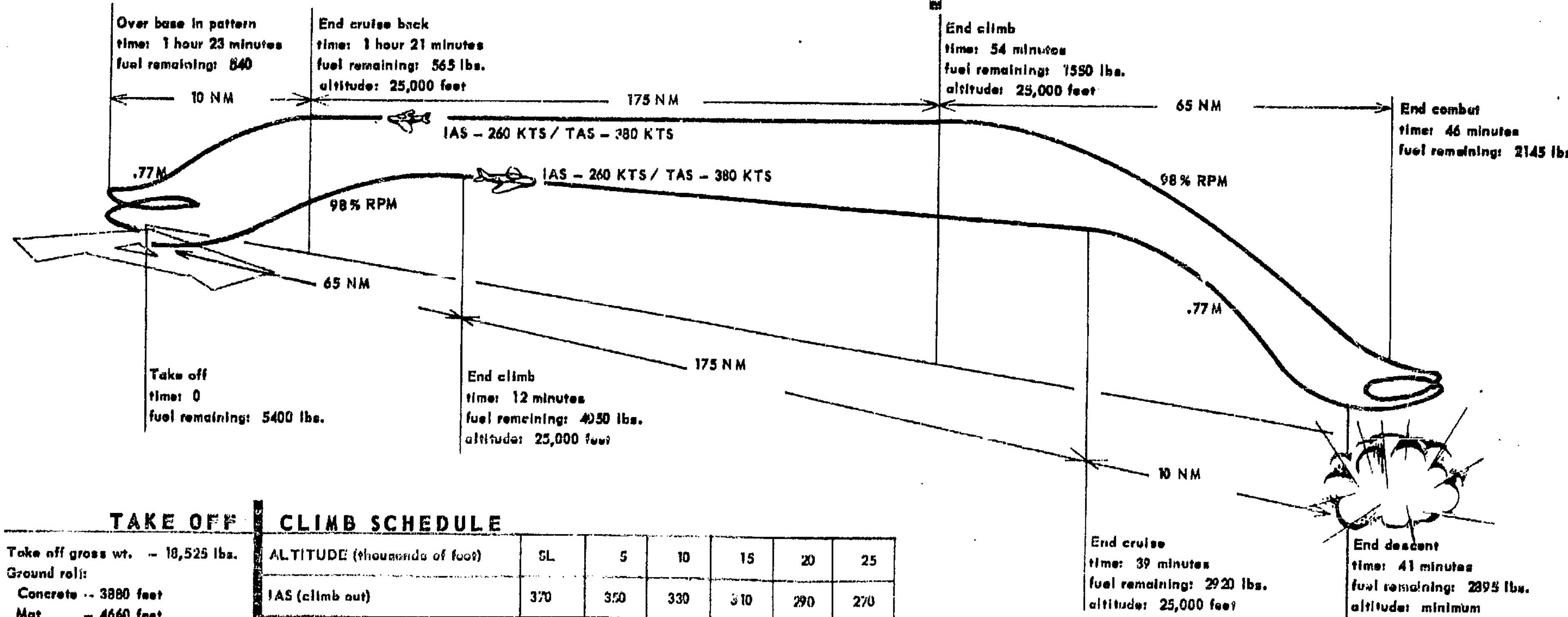
FIGURE #19

CONFIGURATION F-86F 25 & 30



with two 200 gallon tanks
and four century launchers

total radius of action 250 N.M.



TAKE OFF

Take off gross wt. – 18,525 lbs.
Ground roll:
Concrete -- 3880 feet
Mat – 4660 feet

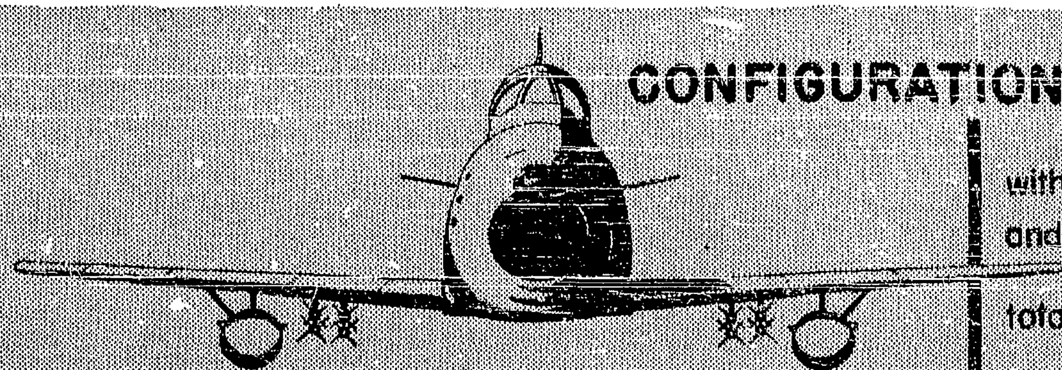
CLIMB SCHEDULE

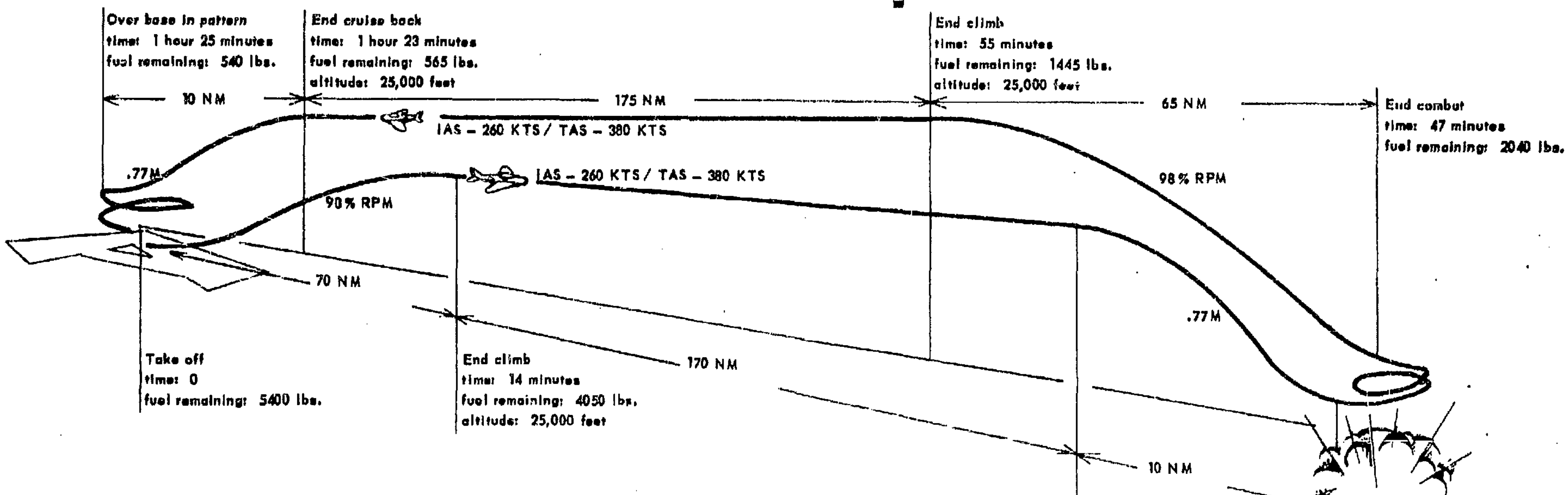
ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	370	350	330	310	290	270
IAS (climb back)		390	370	345	320	295

FIGURE #20

CONFIGURATION F-66F 25 & 30

with two 200 gallon tanks
and eight 5 inch HVAR's
total radius of action 250 N.M.





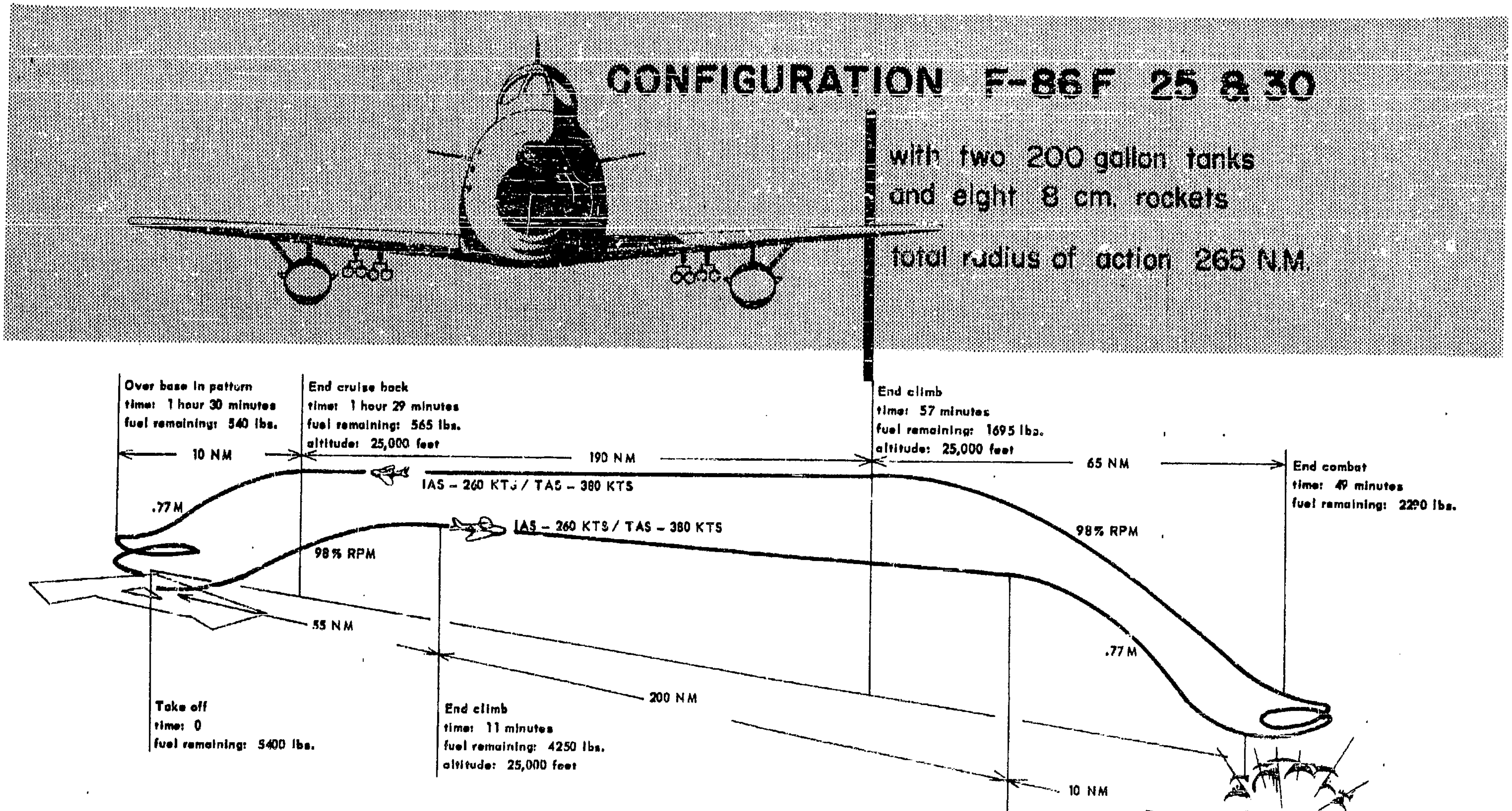
TAKE OFF

Take off gross wt. – 19,050 lbs.
Ground roll:
Concrete – 4000 feet
Mat – 4000 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	330	310	295	270	265	250
IAS (climb back)		390	370	345	320	295

FIGURE #21



TAKE OFF

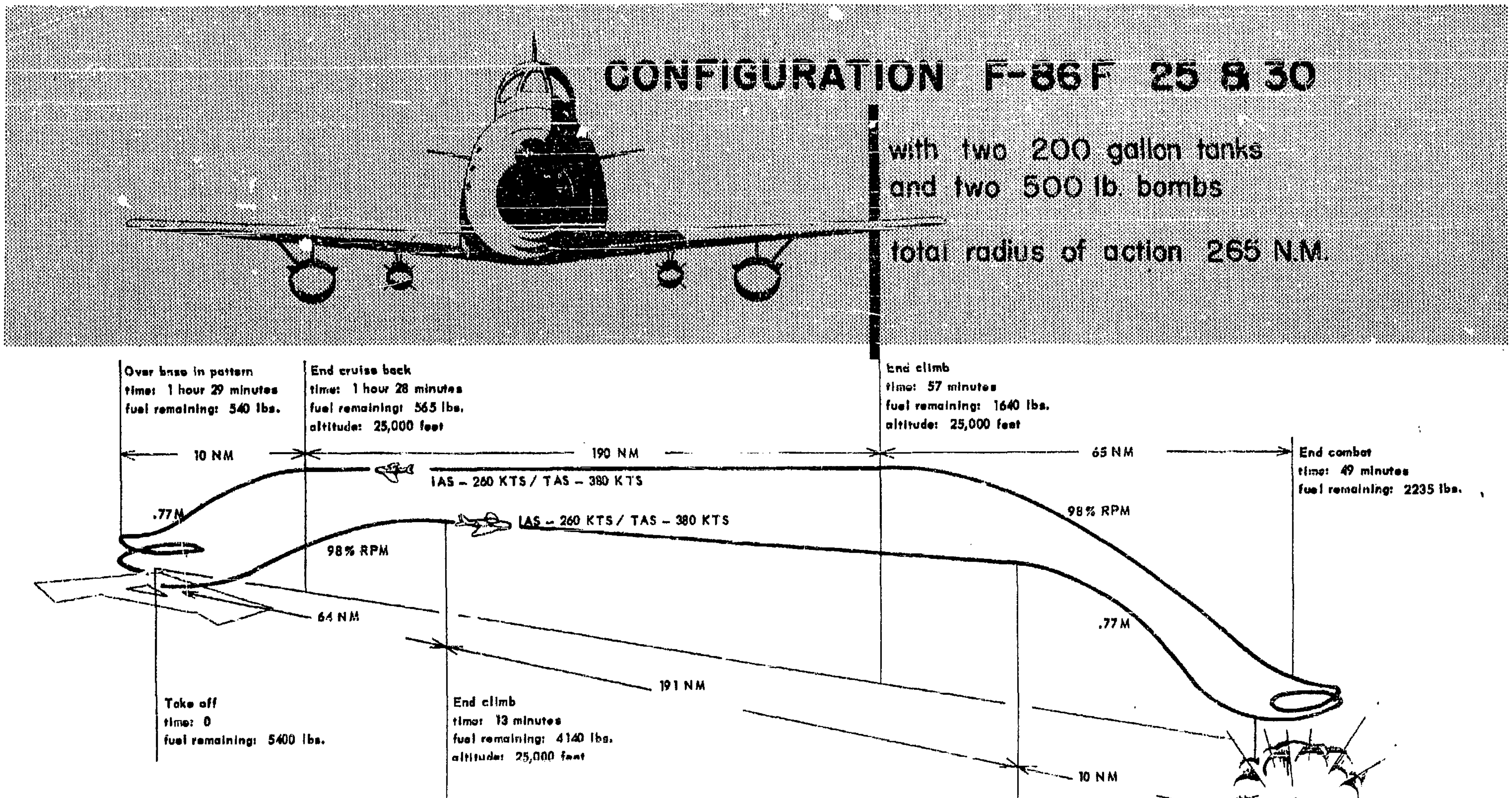
Take off gross wt. – 18,130 lbs.
Ground roll:
Concrete – 3000 feet
Mat – 4560 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	340	325	310	295	275	260
IAS (climb back)		390	370	345	320	295

FIGURE #22

Appendix D, Page 26



TAKE OFF

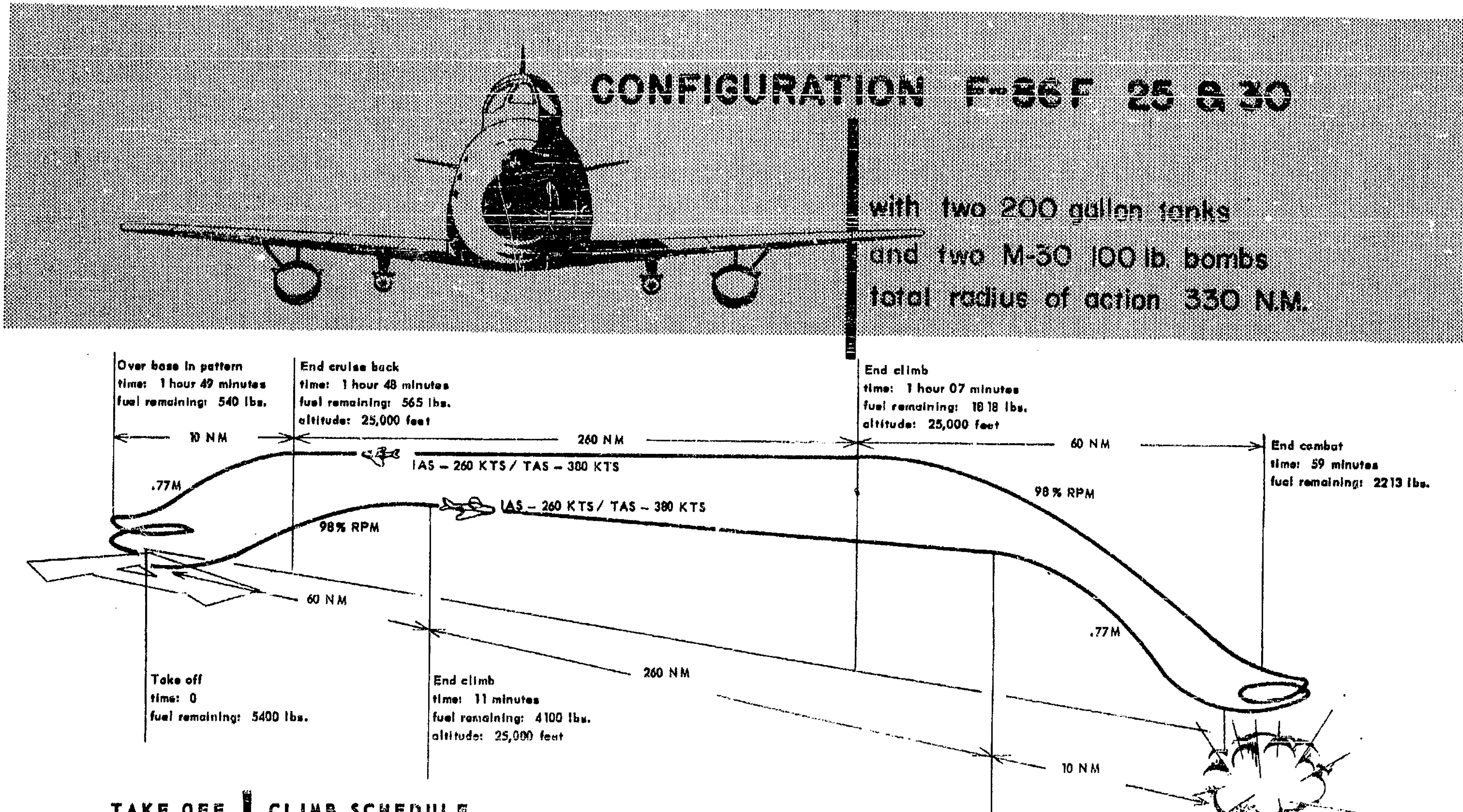
Take off gross wt. – 18,950 lbs.

Ground roll:
Concrete – 3980 feet
Mat – 4780 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	325	305	290	275	260	245
IAS (climb back)		390	370	345	320	295

FIGURE #23



TAKE OFF

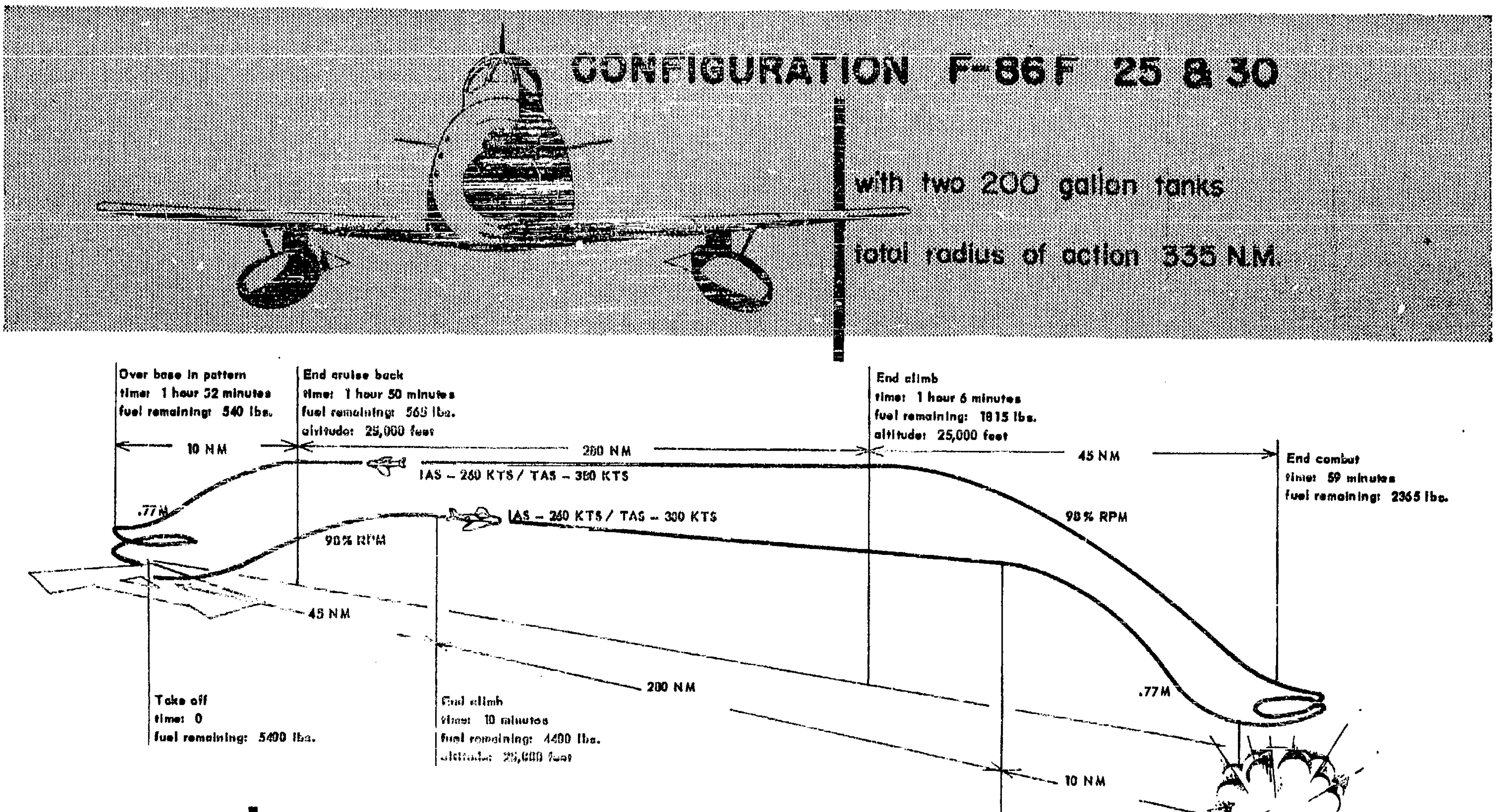
Take off gross wt. – 18,150 lbs.
Ground roll:
Concrete – 3800 feet
Mat – 4560 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	370	350	330	310	290	270
IAS (climb back)		390	370	345	320	295

FIGURE #24

Appendix D, Page 28



TAKE OFF

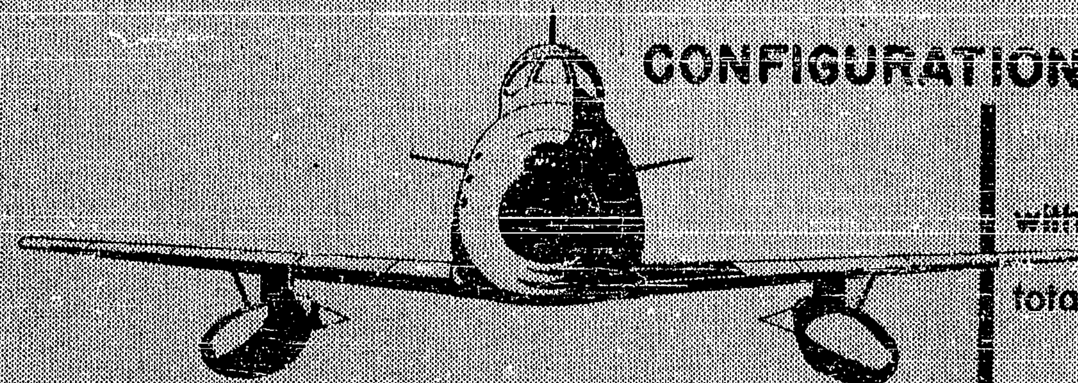
Take off gross wt. – 17,950 lbs.
Ground roll:
Concrete – 3780 feet
Mat – 4540 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25
IAS (climb out)	370	350	330	310	290	270
IAS (climb back)		350	330	310	290	270

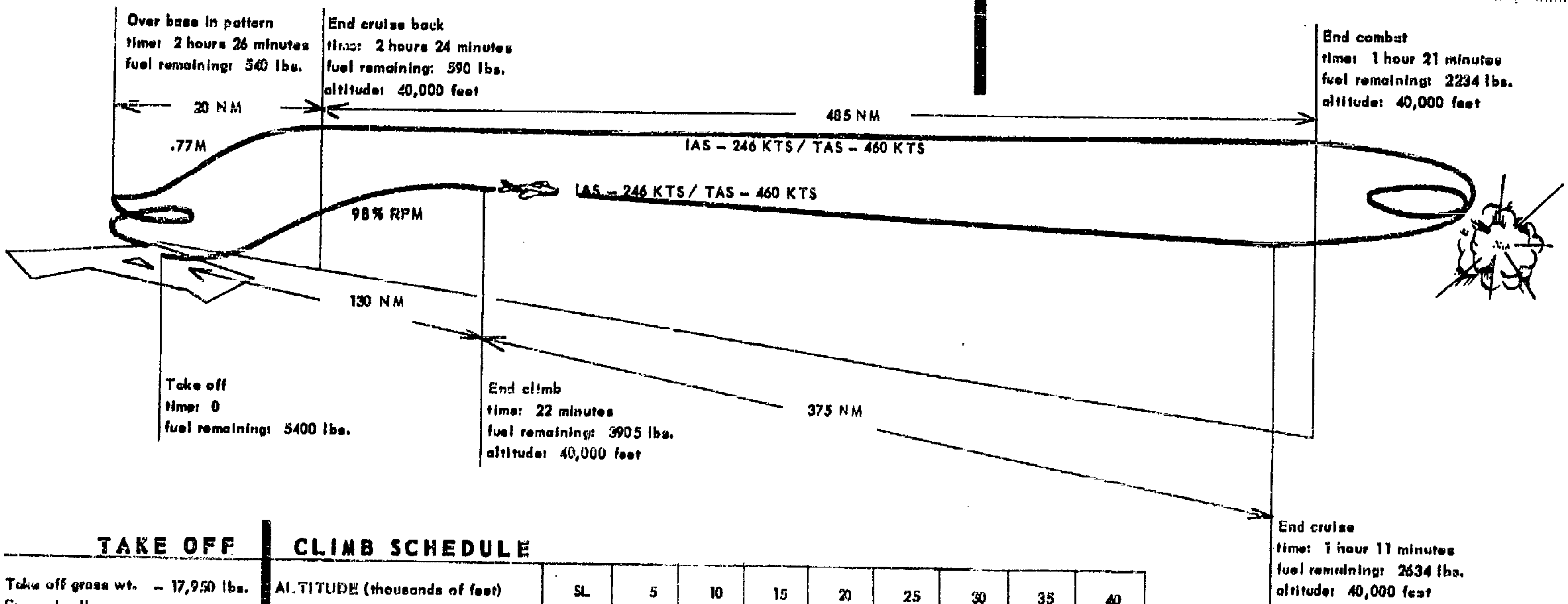
FIGURE #25

CONFIGURATION F-86F 25 & 30



with two 200 gallon tanks

total radius of action 505 N.M.



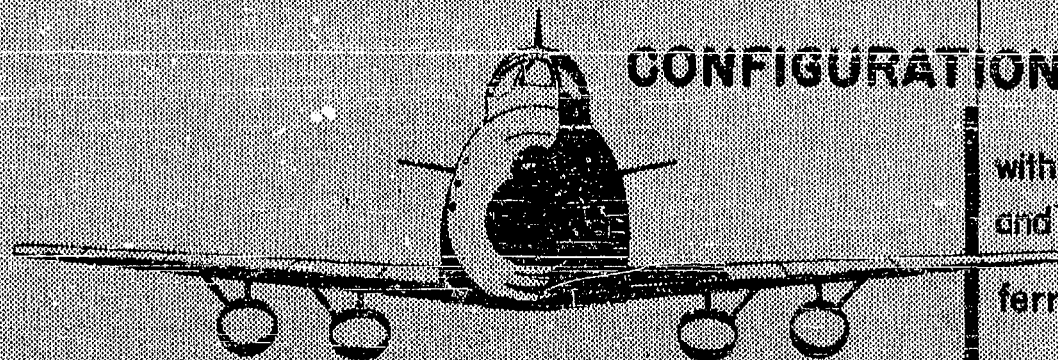
TAKE OFF

Take off gross wt. – 17,950 lbs.
Ground roll:
Concrete – 3780 feet
Mat – 4540 feet

CLIMB SCHEDULE

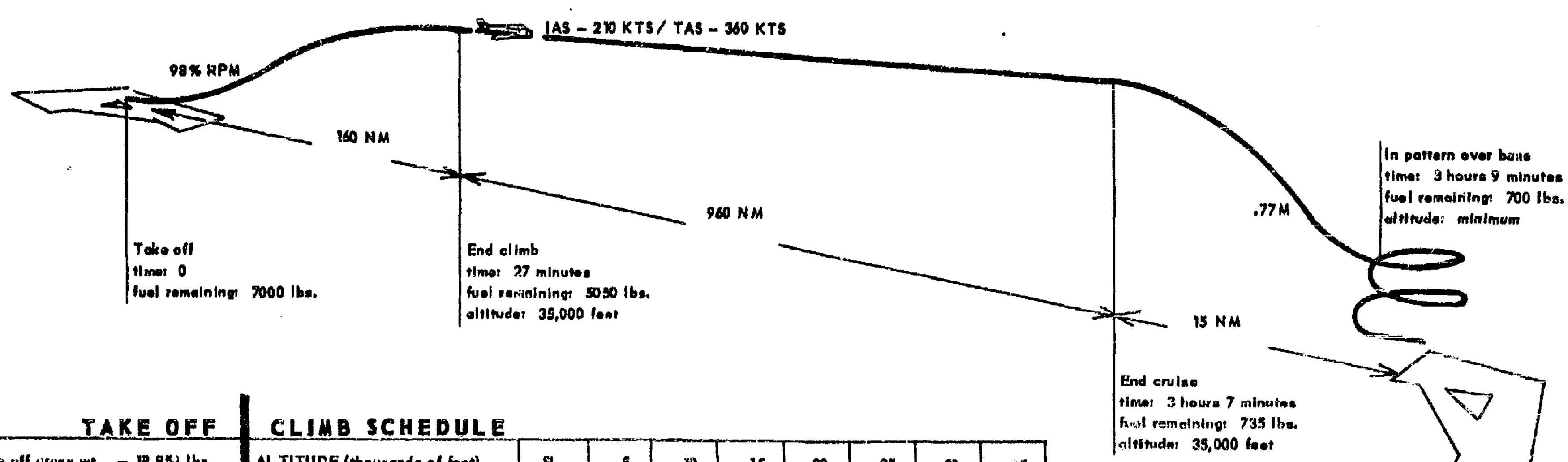
ALTITUDE (thousands of feet)	SL	5	10	15	20	25	30	35	40
IAS (climb out)	370	350	330	310	290	270	250	230	210

FIGURE #26



CONFIGURATION F-86F 25 & 30

with two 200 gallon tanks
and two 120 gallon tanks
ferry range 1135 N.M.



TAKE OFF

Take off gross wt. – 19,850 lbs.
Ground roll:
Concrete – 4180 feet
Mat – 5020 feet

CLIMB SCHEDULE

ALTITUDE (thousands of feet)	SL	5	10	15	20	25	30	35
IAS (climb out)	320	300	290	285	270	255	245	230

FIGURE #27

HARMONIZATION, MAINTENANCE AND SUPPLY

1. Harmonization: The following harmonization and boresight procedure for guns and sight was used during the operational suitability test. This procedure is primarily for air-to-air gunnery since the requirement for survival during aerial combat is considered most important.

a. Materiel Needed:

(1) Sight Line Level Indicator.

(2) Computer Level.

(3) Gunner's Quadrant.

(4) Leveling Bar.

(5) Plumb Bobs and Lines (2 ea.).

(6) Breech Sighting Tool.

(7) Aircraft Jacks and Pads.

(8) External Power Supply.

(9) Target at 1800-foot range. Size - 8 feet square with 3-foot bull's eye.

b. Procedure:

(1) Jack the aircraft up to normal flight attitude, using gunner's quadrant to attain correct angle.

(2) Level the sight computer to plus or minus one degree.

(3) Align plumb bob lines on center of target.

(4) Using sight line level indicator for reference, adjust the sight head elevation to reference point keeping the sight in electrical cage.

(5) Keeping the sight caged, elevate target to coincide with pipper.

(6) Boresight guns using sighting tool.

(7) Uncage the sight and set 1800-foot slant range into the sight system in order to allow for bullet drop.

(8) With the sight in the uncaged position, jack the nose of the aircraft up until the pipper is again on the bull's eye.

(9) Fire one round from each gun, adjusting the gun until the round hits the bull's eye.

(10) Fire a thirty round burst, five rounds from each gun. Caution: If the jacks are not properly set, there is a possibility that the aircraft will push them over.

(11) Check the entire target for hits. Sixty-six and two thirds (66-2/3) percent must be obtained.

2. Maintenance:

a. Aircraft:

(1) The J47-GE-27 engine gave a minimum amount of trouble during the conduct of the test. Servicing requirements for this engine are no different than for the J47-GE-13 engine.

(2) During the early phases of the project, slow and intermittent gear retractions were encountered. It was found that the hydraulic utility systems had not been serviced as per specifications. Due to the high initial rate of climb on this aircraft, a low fluid level in the utility reservoir will cause cavitation of the utility pump.

(3) At approximately 35:00 hours of flying time, the fuselage and wing cell fuel filler caps seized and the locking pins were sheared during removal. This trouble stemmed from failure of the locking edge of the adaptor assembly to which the filler cap locks. Unsatisfactory reports have been submitted and the contractor is presently investigating this failure.

(4) Four (4) failures of the switch assembly, Part Number 1516-15-1, in the Alternate Control System were discovered during the test. It is recommended that these switches be inspected at every 25:00 hour inspection as detailed in T.O. 01-60JLD-2, paragraph 2-91.

b. Gunsight and Radar:

(1) Adequate test equipment must be provided the using organization if full advantage is to be taken of the improvements in performance. One complete system test set composed of the G-3 System Analyzer, Optical Sight Tester, Constant Speed Portable Turntable and Vacuum Pump for calibration checks, plus three (3) additional G-3 System Analyzers for preflight and normal maintenance checks, are considered essential for adequate maintenance of the A-4 system within a squadron of twenty-five (25) aircraft. The G-2 Test Set now in use with the A-1CM Sight is not considered adequate for the A-4 Sight, but it can be used as an interim measure.

(2) Several flights will be required for the removal of reticle vibration from the sights of newly acquired aircraft. On these flights, it is recommended that all six guns be fired.

(3) One (1) of the sights of the operational suitability test aircraft was found to have a loose deflection gyro mount and the screws holding down the gyro required a full turn to tighten. The sight head was also checked and the deflection motor and mirror assembly was found to be insecurely mounted. The screws that held the deflection motor and mirror assembly to the housing assembly were found lying loose in the sight head case.

(4) The sight reticle camera lens adapter extension is extremely large and should be reduced in size.

c. Radio: The AN/ARC-27 is a suitable replacement for the AN/ARC-3 when properly maintained by competent mechanics and supported by an adequate parts supply.

d. Ordnance Loading Difficulties:

(1) The M-38, 100-pound practice bomb cannot be hung on the bomb pylon of the aircraft, however, the M-30, 100-pound practice drill bomb can be hung on the pylon. Plans for the APGC M-38, 100-pound practice bomb rack are shown in Plans #1 and #2 attached.

(2) The M-65, 1000-pound general purpose bomb cannot be adequately hung on the bomb pylon of the aircraft with the presently accepted bomb loading equipment. The Air Proving Ground Command has modified the Mark VI M-1 Bomb Dolly so that these bombs can be loaded, but this modification has not yet been approved. Plans for the modification are shown in Plans #3.

(3) The Mark VII and Mark VIII Portable Bomb Hoists can be used to load 1000-pound bombs, but due to the lack of ground clearance, it is very difficult. Also, the cradle from the Mark VI M-1 Bomb Dolly can be attached to the M-1 Bomb Dolly and used to load 1000-pound bombs.

(4) The M-65, 1000-pound general purpose bomb with the T-142 high speed fin can be hung on the aircraft and the flaps lowered to the full down position if the following procedure is used: Prior to unloading the bombs from the bomb delivery trailer, attach the fin to the bomb and tighten the locking nut securely. This tightening spreads the collar of the fin. Remove the fin and hang the bomb on the pylon. Again place the fin on the bomb and tighten the locking nut finger tight. Rotate the fin while the flaps are lowered very gradually.

(5) There is no standard dolly suitable for loading full E-74 Fire Bombs or E-26 Chemical Tanks on the aircraft. The Air Proving Ground Command has modified the M-1 Bomb Dolly so that full fire bombs and chemical tanks can be loaded, but this modification has not yet been approved. Plans for the modification are shown in Plans #4.

(6) The M-10 Smoke Tank cannot be hung on this aircraft because the length of the pylon causes interference with the air intake nozzle of the tank.

(7) The E-74 Fire Bomb, when modified to carry chemicals, is called the E-26 Chemical Tank, and can be carried on the bomb pylon. (The E-26 tank was not available for testing during this project.) However, since the bomb pylons do not have accessible chemical arming provisions, the following modification must be completed if the tank is to be used:

(a) Loosen and drop the S-2A Shackle and attach a lead wire to the "hot" chemical post on top of the S-2A Shackle.

(b) Replace the shackle into the pylon allowing the attached lead wire to hang down and pass between the shackle and the pylon.

(c) Attach any type of locally made bracket capable of holding a banana plug receptacle.

(d) Attach this bracket and banana plug receptacle to the S-2A Shackle attachment bolt.

(e) Caution must be used since the "hot" chemical post is energized through the bomb arming switch in the nose and tail arming position with or without the battery switch being in the "on" position.

(9) There are no standard acceptable 8 CM rocket racks available for this aircraft, nor do the present A-4 Sights come equipped with sensitivities enabling the firing of 8 CM rockets. Plans for the Air Proving Ground Command 8 CM rocket racks are shown in Plans #5 and #6.

(10) The Century Expendable Launcher was fired from the aircraft with an Air Proving Ground Command adapter without damage to the aircraft or external tanks. However, the launcher tore loose from the aircraft in a 7 "g" pull-up from the target. The contractor is presently strengthening the launcher and additional tests will be conducted at a later date.

3. Supply: Three aircraft participated in the test, logging a total of 91 flying hours. The following is a list of parts consumed during the conduct of the test:

a. Aircraft: See Table I.

b. Gunsight and Radar: See Table II.

c. Radio, UHF, AN/ARC-27: The radio-transmitter units were removed a total of six (6) times for the three aircraft.

d. Additional Tools Required For Armorers: Due to the capability of the F-86F, dash 25 and dash 30 series, aircraft to carry such a large variety of external configurations, and the need for expeditious changing of these configurations, it was found that the Equipment Components List No. 10-46-1, Kit Weapons Mechanic, dated 1 January 1952, must be amended to include one each of the following:

Additions:

Class 17-B

Stock No.	Nomenclature
7900-015550	Bar-socket wrench extension 9/32" SD 2"
7900-015600	Bar-socket wrench extension 9/32" SD 6"
7900-015605	Bar-socket wrench extension 9/32" SD 6" Flex
7900-015800	Bar-socket wrench extension 3/8" SD 5"
7900-044201	Bit-screwdriver 9/32" SD 3/16" WOB
7900-044201-6	Bit-screwdriver 9/32" SD 3/8" WOB
7900-044500-3	Bit-screwdriver crosspoint 9/32" SD 1/4" Reed & Prince
7900-044500-35	Bit-screwdriver crosspoint 9/32" SD 1/4" Phillips head
7900-044500-42	Bit-screwdriver crosspoint 9/32" SD 3/8" Reed & Prince
7900-044500-45	Bit-screwdriver crosspoint 9/32" SD 3/8" Phillips head
7900-081016	Case-mechanic steel tool 18" x 10" 13" V top 4 tray
7900-427300	Handle-socket wrench ratchet, male 9/32" SD
7900-427330	Handle-socket wrench ratchet, male 3/8" SD
7900-427920	Handle-socket wrench speed 9/32" SD
7900-427940	Handle-socket wrench speed 3/8" SD
7900-536290	Pliers-curved, needle nose 6"
7900-563300	Pliers-vise grip, 10" 0" to 1 1/4" cap
7900-563340	Pliers-water pump packing nut 9"
7900-631700	Remover & Replacer lock ring
7900-688100	Socket-6 point 9/32" SD 3/16"
7900-688190	Socket-6 point 9/32" SD 1/4"
7900-688250	Socket-6 point 9/32" SD 5/16"
7900-688280	Socket-6 point 9/32" SD 11/32"
7900-688340	Socket-6 point 9/32" SD 7/16"
7900-696180	Socket-12 point 3/8" SD 3/8"
7900-696210	Socket-12 point 3/8" SD 7/16"
7900-696270	Socket-12 point 3/8" SD 1/2"
7900-695320	Socket-12 point 9/32" SD 3/8"
7900-695410	Socket-12 point 9/32" SD 1/2"
7900-695330	Socket-12 point 3/8" SD 9/16"
7900-696390	Socket-12 point 3/8" SD 5/8"
7900-696450	Socket-12 point 3/8" SD 11/16"
7900-696510	Socket-12 point 3/8" SD 3/4"
7900-724870	Stone-sharpening ark. Hard tri 4" x 1/4"
7900-724850	Stone-sharpening ark. Hard oval 4" x 1/2" x 3/16"

Stock No.	Nomenclature
7900-774480	Tape-rule 72"
7900-833580	Wrench-adj jaw single end 4"
7900-833670	Wrench-adj jaw single end 10"
7900-838465	Wrench-box double head 1/4" x 3/16"
6900-838472-3	Wrench-box double head 5/16" x 3/8"
7900-838473-8	Wrench-box double head 7/16" x 1/2"
7900-838474-4	Wrench-box double head 9/16" x 5/8"
7900-844450	Wrench-open end double hd 1/4" x 5/16"
7900-844505	Wrench-open end double hd 5/32" x 5/16"
7900-846010	Wrench-open end double hd 3/8" x 7/16"
7900-846460	Wrench-open end double hd 1/2" x 9/16"
7900-846970	Wrench-open end double hd 5/8" x 3/4"
7900-847690	Wrench-open end double hd 13/16" x 7/8"
7900-848360	Wrench-open end double hd 1" x 1 1/8"
7900-848600	Wrench-open end double hd 1 1/16" x 1 1/4"
7900-850610	Wrench-open end double hd 15 deg & angle 3/8" x 3/8"

Class 08-A

Stock No.	Nomenclature
7700-331862	Flashlight-2 cell prefocused rt. angle spotlight

Class 29

Stock No.	Nomenclature
6700-381220	Padlock-self locking (or reasonable substitute)

Deletions:

Class 17-B

Stock No.	Nomenclature
7900-469840	Kit-tool 16 x 7 x 7 inch empty

TABLE I

AIRCRAFT PARTS USED DURING TEST

PROJECT NO. APG/TAT/90-A

CLASS	AF S/N OR STOCK NO.	PART NUMBER	NOMENCLATURE	CONSUMPTION
03B	4103	147062M-C	Brake Assembly	8
04C	3900	207947	Tires	14
04C	3900	207948-5	Tubes 26 x 6	6
01M	0110-165	31876	Windshield - Armor Glass	2
03F	4502	39B5435	Gas Caps - Fuel	10
01M	0110	176522	Bracket Assembly - Horizontal Stabilizer	4
05G	2334-25100	A37A1B1	Gear Indicator Instrument	2
03I	4839	TF31400-3	Pump Assembly - Fuel Boost	1
01M	52-4347	54014	Knob Assembly - Auto Cockpit Heat Control	1
03C-2	4220-2CM77B2		Starter Generator Assembly	1
03C-1	4227	167B	Valve Anti-icing	1
03C-2	9426	22720-2	Switch - Hydraulic Pressure	3
03I-1	4804	AN6236-2	Filter - Low Pressure Fuel	1
03J	4907	3509	Jar - Battery Sump.	1

CLASS	AF S/N OR STOCK NO.	PART NUMBER	NOMENCLATURE	CONSUMPTION
03C	4202	AN3161-D10	Circuit Breaker - Alternate Hydraulic Pump	1
03C	4202	AN3161-D10	Circuit Breaker - Trim Light	1
	Repaired at Base Shops		Seal "O" Ring - Hydraulic Accumulator	1
	Repaired at Base Shops		Seal "O" Ring - Hydraulic Filter	1
	Repaired at Base Shops		Seal "O" Ring - Hydraulic Reservoir	1
	Repaired at Base Shops		Seal "O" Ring - Speed Brakes	2
01M	0110-151	54251	Switch, Micro - Gear Handle	1
01M	1AMJ-175	54331	Switch, Micro - Gear Sequence	2
03C-2	4221	3040-B1-24	Light Assembly - Taxi	1
03F	4519	G275A	Hose - "G" Suit	1
05A	6240	673447	Control Unit - Directional Gyro	1
05C	6034	1631-6H-B1	Instrument - Rate of Climb Indicator	1
05G	2334	25100-A37A1-1-A3	Instrument - Hydraulic Pressure	1
03C-1	4278	M3220	Actuator Assembly - Flap	2

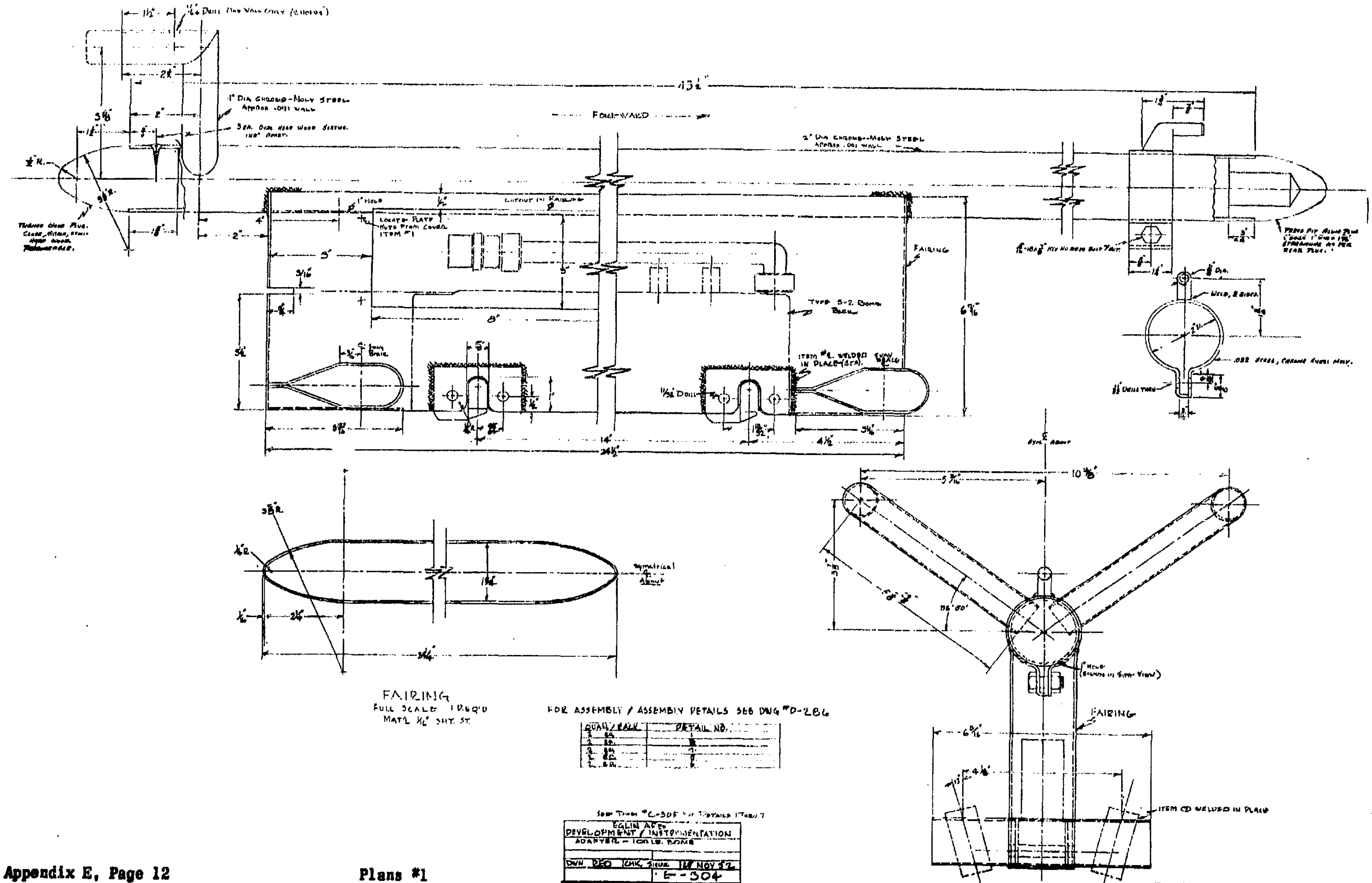
CLASS	AF S/N OR STOCK NO.	PART NUMBER	NOMENCLATURE	CONSUMPTION
	N.I.S.L.		Light Bulb - Landing Gear Handle	1
08B	3Z1946		Fuzes	4
	Local Manufacture		Line - Metal Hydraulic	1
02A	0200	J-476E-27	Engines - Turbo Jet	2

TABLE II

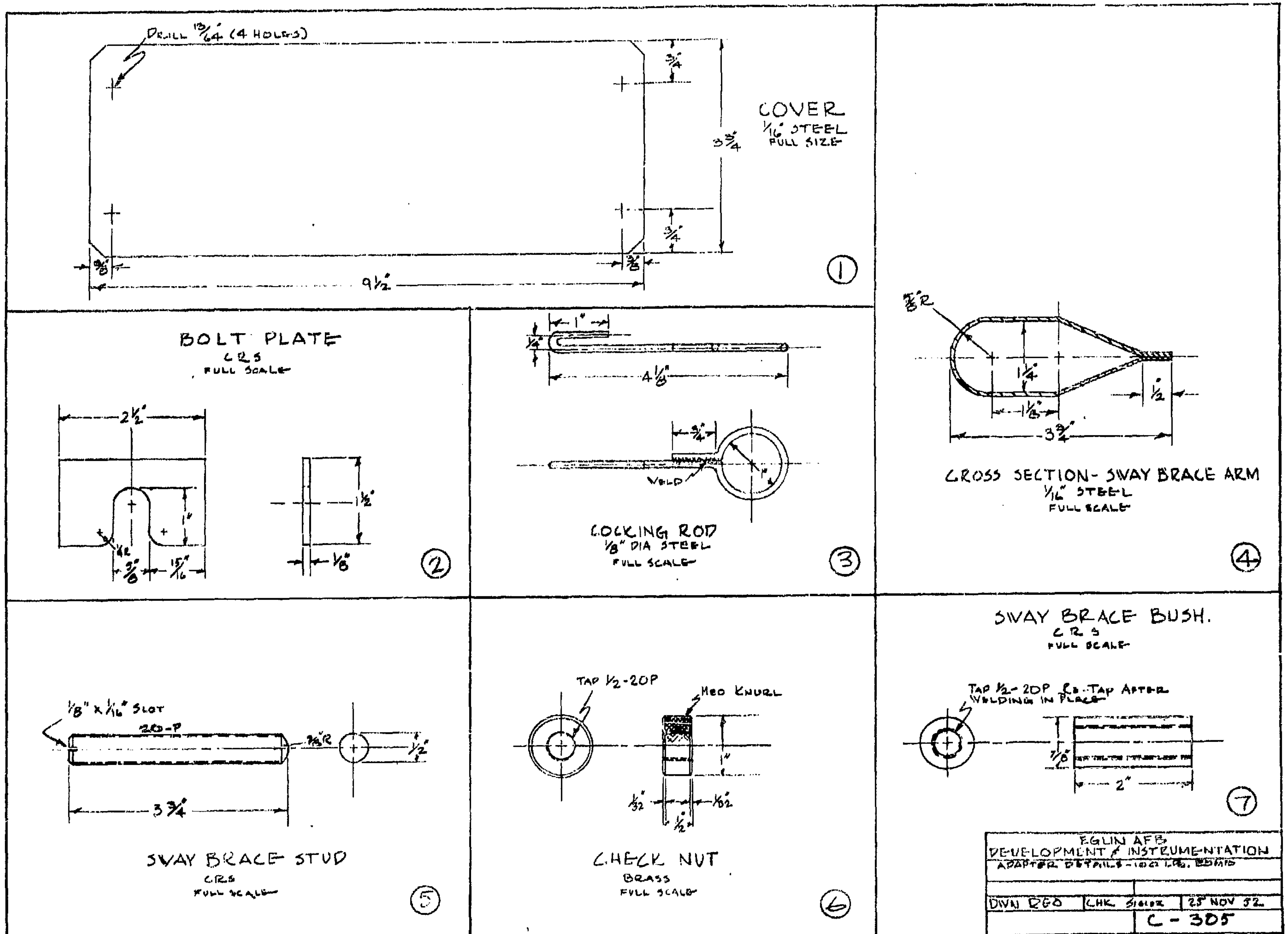
GUNSIGHT AND RADAR PARTS USED DURING TEST

PROJECT NO. APG/TAT/90-A

CLASS	AF S/N OR STOCK NO.	PART NUMBER	NOMENCLATURE	CONSUMPTION
16S	3370	274000-2245	Tube 2K25 (APG/30)	1 ea
16S	3370	286000-6215	Tube 6AK5 (APG/30)	1 ea
03C-3	4243	305	E-1 Static Converter	1 ea
08B	8800	356110	½ Amp. Fuze	1 ea
08B	8800	361212	3 Amp. Fuze	2 ea
08B	8800	46698	Reticle Bulb	1 ea
11B	5200	562010	ME-118 Positioning Mechanism	1 ea
03C-I	4295	1-100A115D-6	Eicor Inverter	1 ea
08B	8800	356110	½ Amp. Fuze	2 ea
08B	8800	361216	5 Amp. Fuze	2 ea
08B	8800	361210	2 Amp. Fuze	3 ea
11B	5200	008957	Range Amplifier	1 ea


FORWARD
FAIRING
FULL SCALE 1 REQ'D
FOR ASSEMBLY / ASSEMBLY DETAILS SEE DWG #D-286
EGLIN AFB
DEVELOPMENT / INSTRUMENTATION
E-304

Plans #1



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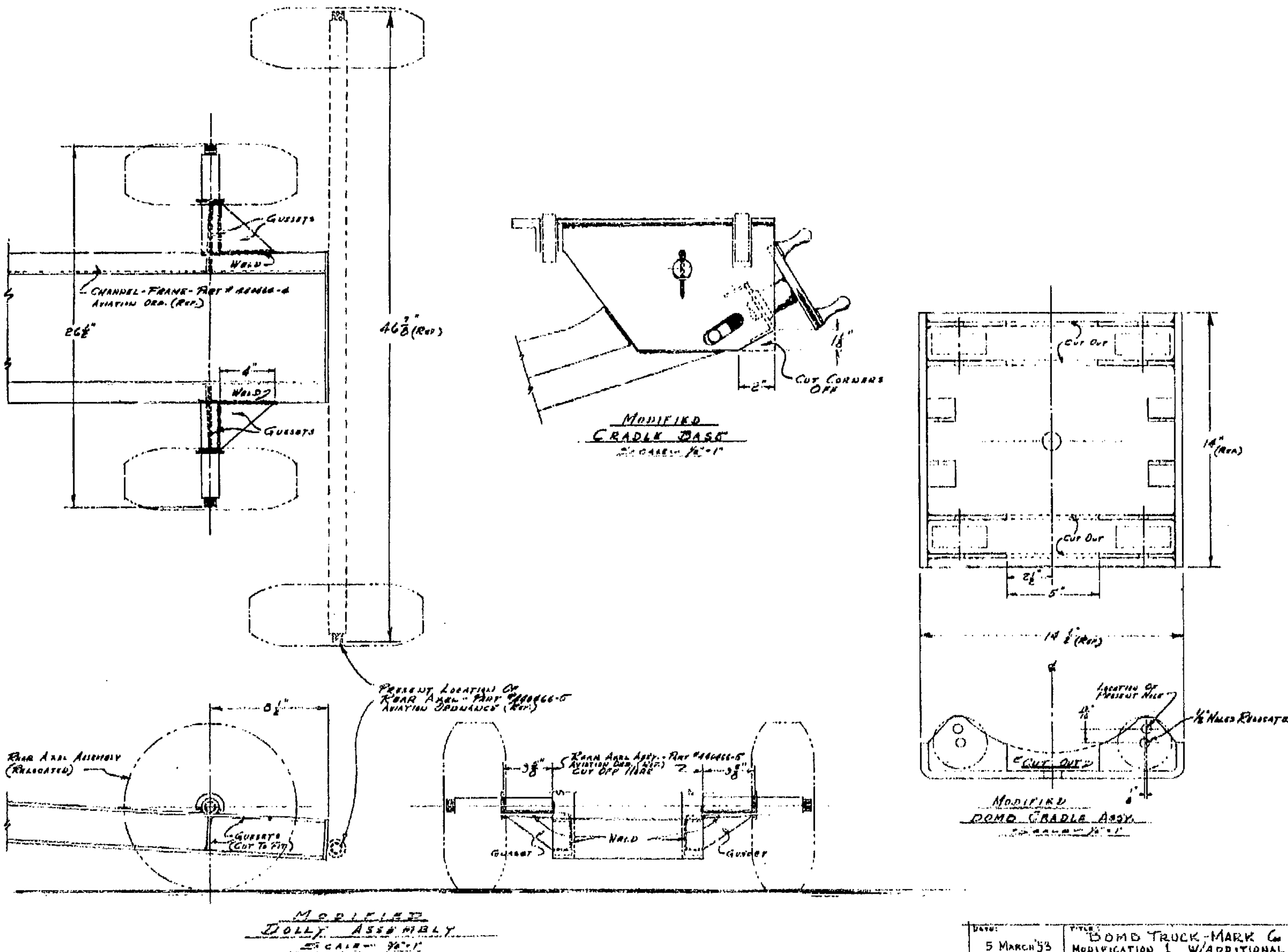
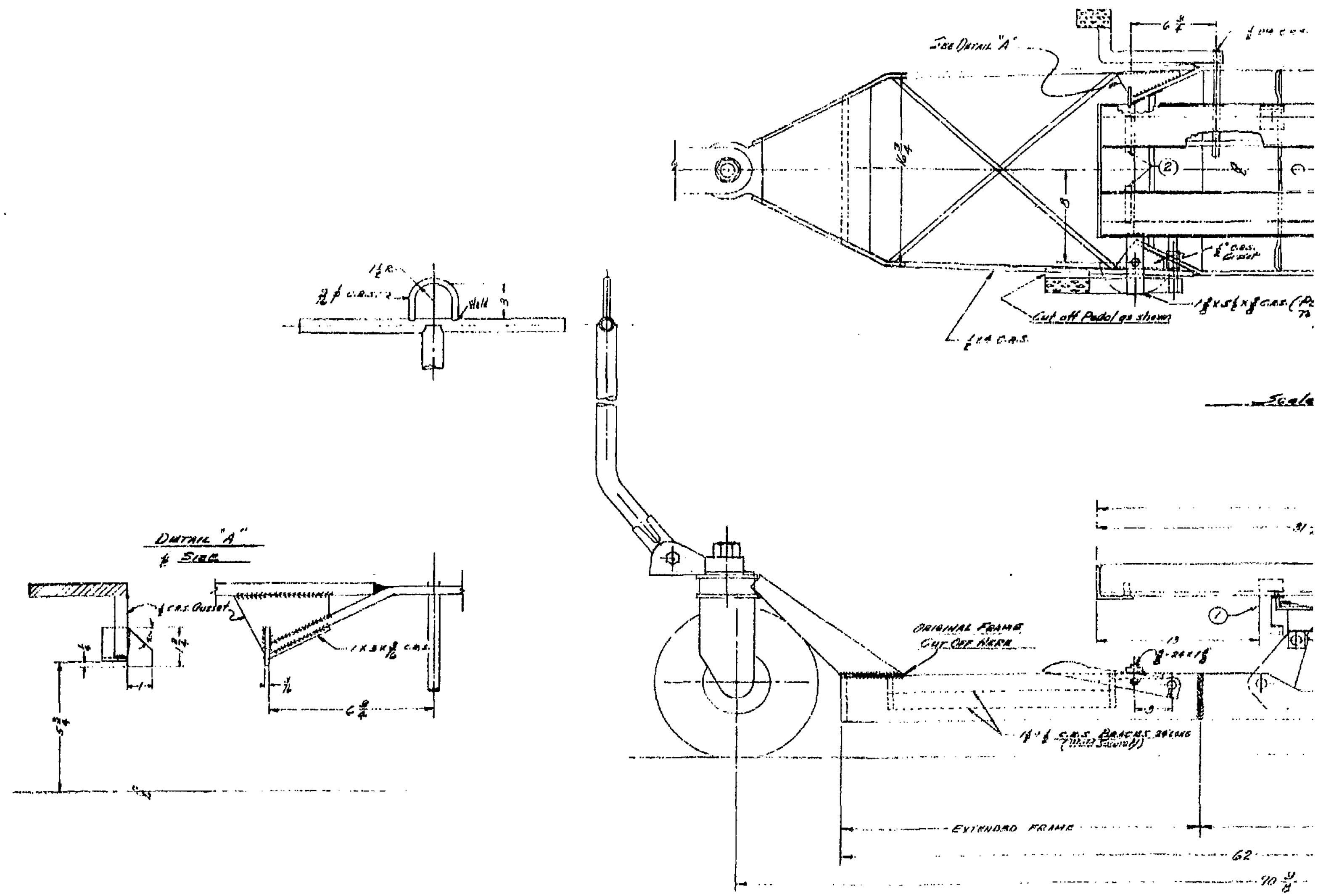
Plans #2

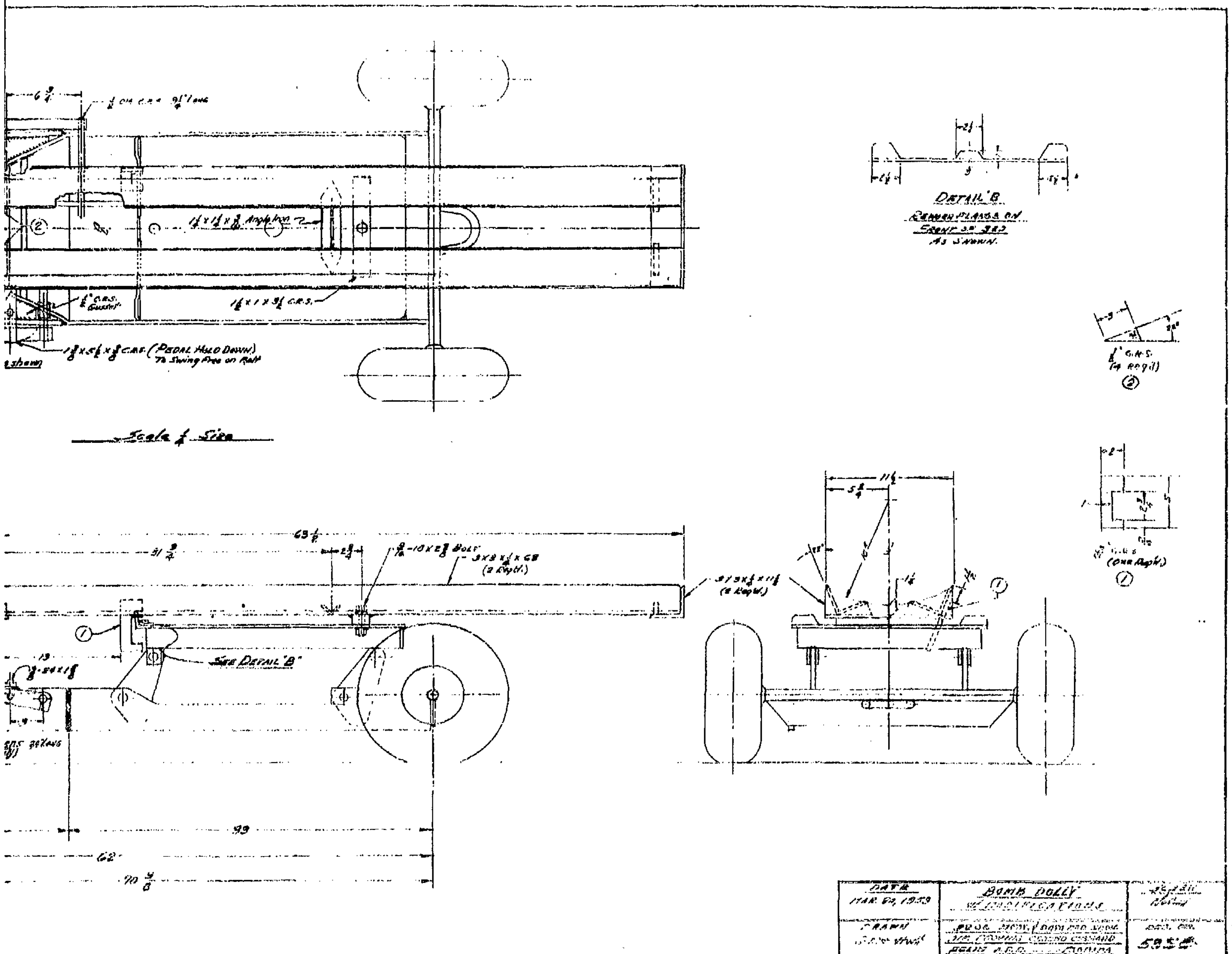


Date: 5 March '53	Title: Bomb Truck-Mark 6 Modification 1 W/Additional Modification By A.P.G.C.	Scale: As Noted
Drawn: Hwt	3206 Maint. & Data Red. Sq. – Drafting & Design Sec. Air Proving Ground Command Eglin AFB, Florida.	Drawing: 53Q3
Checked: Hwt		

Plans #3

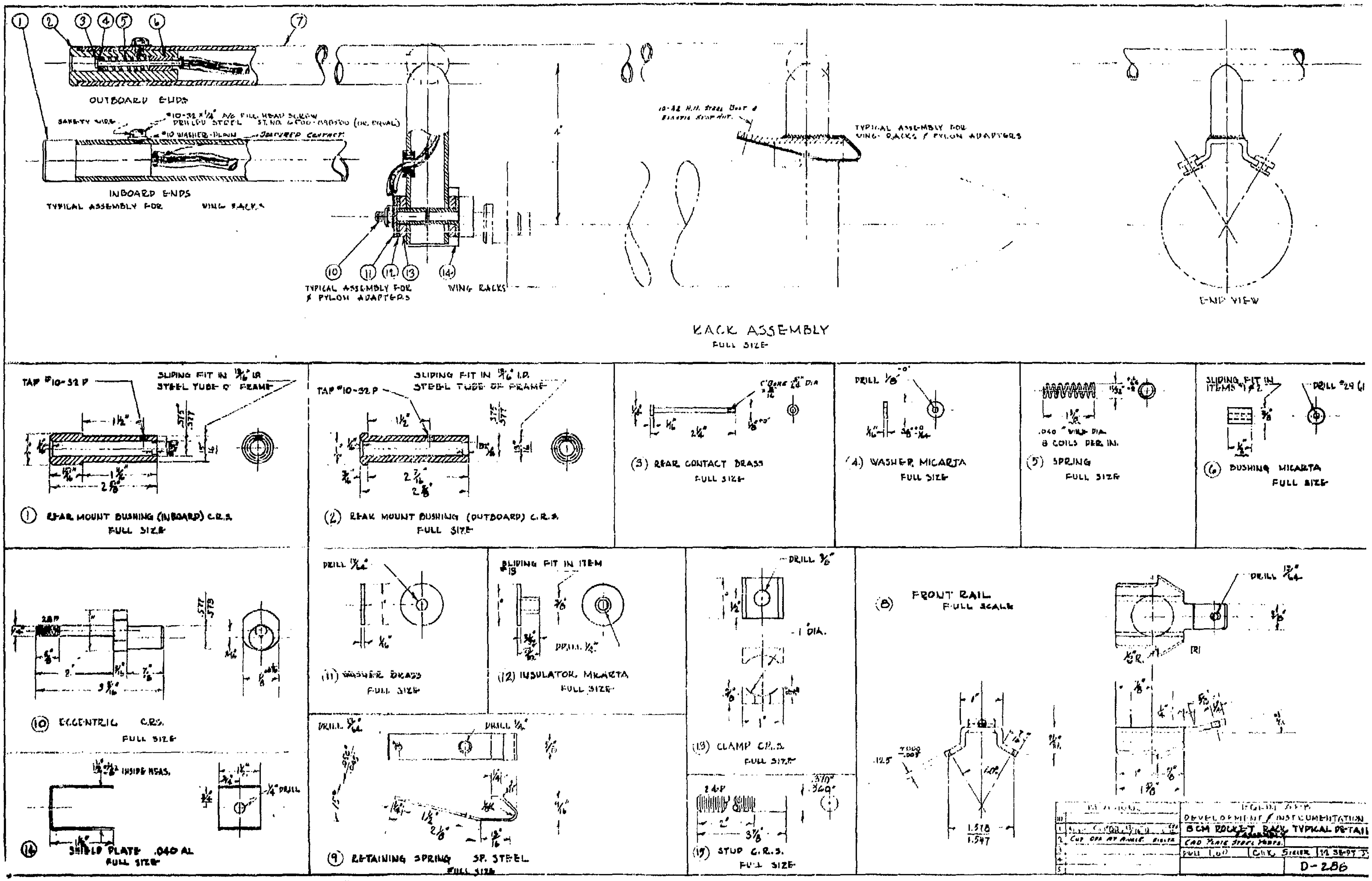

See Detail "A"
Cut off Pedal as shown
Detail "A"
Original Frame
Cut Off Here
Extended Frame
62
Scale

Plans #4



Project No. APG/TAT/90-A
Page 111

2



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Plans #6

Project No. ARG/TAT/90

TRAINING, OPERATIONAL TECHNIQUES, AND TURN-AROUND TIMES

1. Pilot Transition: The incorporation of hydraulically-powered irreversible aileron and elevator controls and artificial feel in the F-86F makes a transition period necessary for those pilots who have never flown the F-86E or F aircraft. Because of the bungee bobweight artificial feel, the control stick forces of the F-86F, during maneuvering flight, are relatively uniform over the entire speed and altitude range of the aircraft. The irreversible controls of the F-86F improve its stability and maneuverability for most maneuvers; however, for full proficiency, familiarization flights should be flown to acquaint the pilot with handling characteristic during instrument, formation, and gunnery flights. Precision instrument flying is more difficult in the F-86F than in the E at normal cruising speeds. At all speeds, the pilot will probably dislike its handling characteristics until proficiency is obtained. Because of an inherent lag in the hydraulic controls, the pilot will tend to over-control during the first few flights, but as proficiency is gained in the aircraft, the pilot will come to like the ease with which it handles at all speeds and altitudes and his fatigue will be decreased.

2. Aerial Gunnery: Transition at aerial firing with the A-4 Sight should be preceded by ground training conducted by qualified personnel with the aid of sight mock-up. A list of related tests and reports is listed as Appendix B which will be useful in obtaining material for training purposes. When pilots demonstrate an understanding of the sight, a transition period of 10 to 30 missions should be flown, utilizing the first few missions for indoctrination only. Tracking missions should follow and are of utmost importance since the sight and radar will not give satisfactory results without smooth tracking. The irreversible controls will tend to cause over-controlling on these tracking passes, but this will disappear with experience. Sight Reticle cameras should be used on all aerial gunnery training missions. Their use is the only positive method of assessing tracking and provides a complete history of each pass. Previous test experience and recent reports from FEAF indicate that aerial gunnery missions using the flag type tow target do not prepare the pilot for the high speed combat of jet fighter versus jet fighter. It is recommended that maximum emphasis be placed on high speed simulated combat, using another jet fighter as the target. The use of reticle cameras on these training missions will give a complete assessment of simulated firing results.

3. <u>Ground Gunnery</u>: Attacks at ground gunnery targets must be executed with caution. The axial-flow engine is more susceptible to damage from ricochets when picked up by the air intake scoop than the centrifical flow engine. When strafing attacks are made with external fuel tanks, there is a tendency for porpoising to begin at the point of pull-out at very high speeds. It is recommended that the dive brakes be used on all attacks to lessen the chance of overspeeding and porpoising resulting from over-controlling at this very high speed. The pilots are to remember that the boresight and harmonization patterns in their aircraft are set up for aerial gunnery and when firing at ground gunnery targets, they must do some of the computation normally done by the sight. The wind correction will be the most important correction made by the pilot in ground gunnery. Again the sight reticle cameras will be useful in correcting mistakes.

4. <u>Rocketry</u>: Rocket firing in the F-86F is no different from any other type of jet fighter, except on pull-ups from the target when carrying external fuel tanks at high speed. On these pull-ups, the pilot must use caution, as over-controlling the aircraft will result in a porpoise. The same caution holds when firing 8 CM Rockets at a short range of 2,000 feet. The pull-up must be made rapidly in order to miss the rocket blast and debris. This rapid pull-up must also be made in such a manner that the aircraft is not over-controlled and porpoising begun. It is recommended that the dive brakes be used on rocketry.

5. <u>Manual Pip Control Dive Bombing</u>: (See Appendix B for detailed description of the MPC.) The MPC can be set up on the ground prior to take-off for dive bomb attacks from altitudes of 10,000, 15,000 and 20,000 feet altitudes. In the event 20,000 feet was set up on the index altitude control and the altimeter, and after arriving at the target it was found a cloud level was restricting the use of that altitude, the MPC can very easily be changed to 10,000 or 15,000 feet altitude. The MPC is constructed so as to give a terrain clearance, after bombs have been dropped and pull-up completed, of 2,500 feet. As an example, say the dive bomb run is to be initiated from 20,000 feet altitude from a dive angle of fifty (50) degrees. Fifty (50) degrees is set on the inner scale of the 20,000 feet dial. The index altitude read under the pointer on the outer scale reads 4,800 feet. This altitude index is based on a sea level target. Therefore, when the pilot adjusts the altimeter control located above the radar range indicator, he sets the hairline indicator for the altitude corresponding with the terrain elevation of the target (hypothetical case 2,600 feet). The index altitude pointer is

then set on the red scale at the top to an altitude of 4,800 feet, which was determined from the altitude index scale of the MPC. The release pointer (white needle) will then indicate the altitude at which the bomb should be released. In the example it is 7,200 feet. The altitude index on the manual pip control scale is based on a 2,500 feet terrain clearance, providing the pilot maintains a constant 5 "g" acceleration throughout the pull-out. The pilot is required to quickly glance from the sight tracking to the altimeter to determine the release point. When the two (2) needles coincide the bomb should be released and recovery effected immediately, maintaining a constant 5 "g" pull-out.

e. Entry Technique:

(1) The target should be approached from the side using a ninety (90) degree entry turn. The best entry method at all altitudes is to pull the airplane into a tight turn to the point of encountering light buffet, which occurs at approximately 2¼ to 3 "g" for an entry speed of 270 knots at 20,000 feet. The airplane is turned until the sight approaches the target on the low side in elevation at which time the rate of pull-through is decreased. As soon as the airplane is rolled out of the turn and the sight approaches the target in elevation, the pilot is required to quickly check the canopy lines for a comparison with the horizon to determine whether or not he has obtained the correct dive angle. Attention is instantly returned to sight tracking. Checking the canopy lines serves two (2) purposes: First, if this check is made consistently the pilot can determine the correct dive angle through trial and error and eventually his proficiency can be increased to within a very few degrees of the desired angle; Secondly, if the dive angle is seriously in error (more than ten (10) degrees) it is possible to reset the MPC in the first portion of the dive. If a change of the MPC is made during the dive, then a new release altitude will be indicated. Since the correction in release altitude is secondary in importance to the dive angle correction, it is generally sufficient to release a bit higher or lower as indicated by the new setting on the MPC scale.

(2) Assuming that the pilot has chosen the correct dive angle as set on the MPC, yet due to a slight error in tracking finds that the pip is drifting in azimuth to the left or right, it is advisable that he correct his flight path immediately by use of left rudder in the case of pip drift to the right. This control movement is used only as a measure for determining the amount of aileron or roll to be required to stop the pip drift. Sufficient roll should be added to relieve the yaw developed from holding rudder pressure. This will, of course, be followed by a slight pitch correction as required to bring the pip back on target. At least two (2) seconds of tracking is required to bring the pip back on target and at least two (2) more seconds is required for tracking with the airplane in a steady state i.e., without yaw and acceleration, prior to bomb release. Since the aircraft will normally be trimmed for 270 knots at 20,000 feet, for the flight conditions above, an increasing push-force on the stick will be required as the target is approached, due to the increase in airspeed.

b. Summary: The operation of the MPC system may be summarized as follows:

(1) Turn A-4 "on".

(2) Pedestal selector switch to "Guns" or "Rockets".

(3) Manual Caging Lever to "Uncage".

(4) MPC toggle switch to "Bombs".

(5) Set target altitude on Bombing Altimeter.

(6) Choose MPC dial corresponding to desired entry altitude above target altitude and dive (or climb) to this starting altitude (note that starting altitude will be 10,000, 15,000, or 20,000 feet plus target altitude).

(7) Turn MPC knob to desired dive angle (green scale) and read "Index Altitude" on outer (red) scale.

(8) Set index altitude on Bombing Altimeter (white release pointer now gives correct release altitude above target.)

(9) Prior to entry, stabilize speed at entry value indicated on MPC dial; open speed brakes, pull throttle back to idle and peel off into dive.

(10) Upon completion of roll into dive, settle pip near target and check dive angle with canopy lines. If the dive angle is not within ten (10) degrees of that selected, a correction should be made. Correction may be made by changing MPC setting or by a "Stair Stepping" dive. In the first case, the bombs should be released higher or lower than the original setting by the amount of change of the Index Altitude. This last correction is less important, however, than changing the dive angle setting.

(11) Track target with pip (smooth tracking for the last two (2) seconds is important). When the Bombing Altimeter instrument needles coincides with the white release pointer, release bombs and initiate a 5 "g" pull-out.

6. A-4 Fixed Sight Dive Bombing: Fixed sight dive bombing in the F-86F is no different from any other type of jet fighter, except on pull-ups from the target when carrying external fuel tanks at high speed. The most consistently effective dive bomb attack is to let down to approximately 10,000 feet with the dive brakes extended and throttle in the idle position. At 10,000 feet, reduce the airspeed to 200 knots and by using the ninety (90) degree side approach procedure, set up a dive angle of fifty (50) degrees. The sight is set at 600 foot slant range and any wing span of 100 feet or greater. This setting produces a 160 mil diameter sight reticle. With the sight in the electrical caged position, dive brakes extended, and throttle in the idle position, a dive angle of fifty (50) degrees was established placing the pipper on the target. As soon as the drift has been determined and corrected, the pipper is moved from the target on a line 12 o'clock to the target allowing the edge of the wing span circle to touch the target. This system gives an eighty (80) mil lead factor. At approximately 4,000 feet slant range and an airspeed of 425 knots, the bombs are released.

7. Napalm Bombing: Napalm bombing in the F-86F is no different from any other type of jet fighter, except on single drops at a very high speed. It is not recommended that single releases of E-74 Fire

Bombs, in the presence of two (2) 200-gallon external fuel tanks, be made at speeds exceeding 480 knots except in an emergency. When releases are made at 515 knots or faster, the airplane porpoises violently. (See the test pilots report on porpoising contained in Paragraph 5 of the Results, of Napalm Bombing in Appendix D.) The most consistently effective fire bomb attack is to let down to approximately fifty (50) foot altitude from one-half (½) to one (1) mile short of the target with the A-4 Sight set at 2.25-inch SCAR, normal, rocket position. This setting produces a sixty-eight (68) mil depression. Level flight is to be maintained, with an airspeed of 345 to 465 knots. The pipper is allowed to run along the ground in front of the airplane until it is approximately five (5) feet short of the target where the bombs are released. No attempted technique gave high accuracy in attacks where releases were made above 100 feet <u>in level flight</u>. Initial striking point can vary as much as eighty (80) feet when released from 150 foot altitude in level flight. For attacks in excess of 465 knots, (not over 480) or for dives from fifteen (15) to thirty (30) degrees the 2.25-inch SCAR, steep, setting must be used. This setting produces a fifty-four (54) mil depression. If the airplanes are equipped with the Manual Pip Control, the above depressions can very easily be put into the sight reticle by adjusting the index altitude control knob.

8. <u>Turn-Around Times</u>: Starting with a clean airplane, the following turn-around times are based on the cond[illegible] on that the ordnance, tanks, tools, and personnel are available at the airplane. Times are based on one hose for refueling, three men used for hanging tanks, and four men used for attaching bomb pylons and rocket posts. Listed below are: first, times for each individual unit operation; and second, turn around times for each configuration.

a. <u>Individual Unit Times</u>:

(1) Time to hang external tanks - - - - - - - - - - - 30 min.

(2) Time to refuel external tanks - - - - - - - - - - - 15 min.

(3) Time to refuel internal tanks - - - - - - - - - - 10 min.

(4) Time to remove the external tanks and pylons - 25 min.

(5) Time to reload guns - - - - - - - - - - - - - - - - - 20 min.

(6) Time to attach bomb pylons - - - - - - - - - - 15 min.

(7) Time to hang bombs - - - - - - - - - - - - - - - 15 min.

(8) Time to remove bombs - - - - - - - - - - - - - 5 min.

(9) Time to remove bomb pylons - - - - - - - - - - 20 min.

(10) Time to attach eight (8) 5" HVAR posts - - - 10 min.

(11) Time to hang rockets - - - - - - - - - - - - - 20 min.

(12) Time to remove rockets - - - - - - - - - - - - 5 min.

(13) Time to remove rocket posts - - - - - - - - - 10 min.

(14) Time to attach E-74 Fire Bomb - - - - - - - - 15 min.

(15) Time to service fire bomb using the M-3 or E3RE Mixer - - - - - - - - - - - - - - - - - - 10 min.

b. Turn-Around Times for Each Configuration:

(1) Two (2) 200-gallon external fuel tanks and two (2) 1000-pound bombs - - - - - - 1 hr. 45 min.

(2) Two (2) 200-gallon external fuel tanks and eight (8) 5" HVA Rockets - - - - - 1 hr. 45 min.

(3) Two (2) 200-gallon external fuel tanks and two (2) E-74 Fire Bombs - - - - - - 1 hr. 40 min.

(4) If an airplane is equipped with two (2) 500-pound bombs and a change in the mission requires the removal of the bombs and pylons and the installation of rocket posts and rockets, time required will be - - - - - - - - - - - - - - - - 55 min.

(5) If an airplane is equipped with eight (8) 5" HVA Rockets and a change in the mission requires the removal of the rockets and posts and the installation of bomb pylons and two (2) 500-pound bombs, time required will be - - - - - - - - 45 min.

NOTES FOR PILOTS ON

THE USE OF THE

A-4 SIGHT

HQ AIR PROVING
GROUND COMMAND
EGLIN AFB, FLA.

1. INTRODUCTION:

The Air Proving Ground Command has had approximately six years experience with the "A" series sights and the capabilities of these sights are far superior to any system previously tested at APGC. These capabilities cannot be realized, however, unless each pilot is thoroughly indoctrinated on the basic sight and its operational use. The following "training program" has been used quite successfully at the Air Proving Ground Command:

a. Lectures on use of the sight.

b. Demonstrations on sight performance using a "mockup".

c. One "indoctrination mission".

d. Camera gunnery until proficiency is attained.

e. Fixed range gunnery.

f. Radar Gunnery.

g. Camera missions in dive bombing and rocketry.

h. "Wet" missions in dive bombing and rocketry.

The purpose of this booklet is to assist group Commanders in establishing such a program in the field.

2. USE OF THE CONTROLS:

Proper use of the controls is essential and it is surprising the number of missions aborted for "sight malfunction" because a switch was in the incorrect position. A picture of a typical arrangement of the controls is given on page 28.

a. Turning the Sight On: It is recommended that the "Gun-sight AC Power" circuit breaker be pulled when the aircraft is on the ground. After the aircraft starting procedure is complete, close the circuit breaker and place the "GUN-SIGHT & CAMERA" switch in the "SIGHT & CAMERA" position. Advance the dimmer control toward "BRIGHT". The reticle will appear near one edge of the reflector glass. When the sight is properly warmed up, the reticle will suddenly jump to the center of the reflector.

b. Sight Selector Unit: There are three separate controls on the sight selector unit. The Function Selector Switch switches the sight from "guns" to either "rockets" or "bombs". Pressing the "Radar Out" button on the control stick automatically returns the function selector to "guns". If rockets are selected, the rocket selector switch is placed on the type of rocket being fired, and "S" or "N" corresponding to an anticipated steep or normal dive angle, (anything above 40° is considered steep). If bombs are selected, the reticle drops 10 degrees and appears near the bottom of the reflector glass. (It is sometimes necessary for the pilot to raise his head in order to see the reticle in the bomb function). In the bombing function, a "bomb target wind" adjustment is provided for estimating range wind over the target. This is not a critical adjustment and is left on "0" unless definite knowledge of target winds is available. It may also be used to correct consistent early or late releases. With the Function Selector in "Guns", the target speed selector should be placed in the appropriate position. The three choices are High (High Speed Target), Low (Low Speed Target) and Training (Banner Target).

c. Dimmer: The dimmer is used to adjust reticle intensity and should be left in the "dim" position when the sight is not in use in order to prolong the life of the reticle bulb.

d. Manual Range Control: The manual range control is located on the throttle grip and is used to select manual or radar ranging. As the throttle handle is twisted clockwise, the radar is disconnected from the sight by a microswitch. Immediately after leaving the detent (radar) position, the sight goes to maximum range. As the throttle handle is turned further clockwise, the range is decreased and the reticle size increases (see Figure 1). Noticeable improvement over the A-1CM is the rapid response of reticle size to range inputs.

e. Span Setting: An adjustment is provided on the sight head to introduce the estimated target span for manual ranging operations. The effect of the span setting on reticle size is shown in Figure 1.

f. Alternate Bulb Selector Switch: Should the dot and circle disappear during a mission, an alternate bulb may be selected with this switch. It is pointed out that the circle and the dot have the same light source on the A-4 Sights as differentiated from the A-1CM.

g. Caging Systems: There are two separate caging systems on the A-4 Sight. Actuating the handle on the sight head (mechanical caging) locks the prediction mirror at the approximate gun boresight position. With the sight mechanically caged, it is the same as the N-9 Sight.

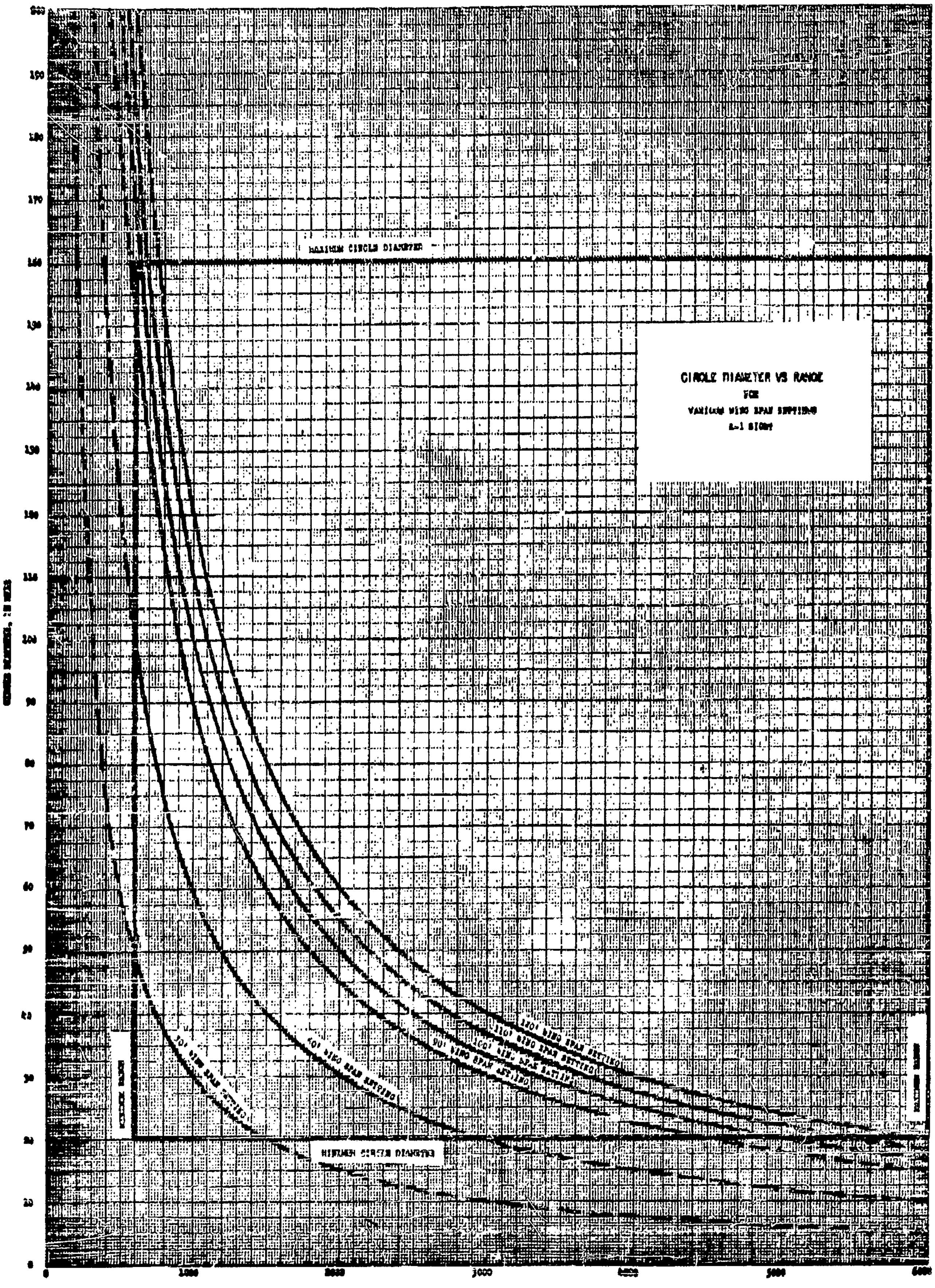


FIGURE 1

The electrical caging system cages the sight in the function selected. For example: electrically caging the sight in the bombing function centers the pipper on the reflector ten degrees below the boresight line. The electrical caging system is used during the entry to an attack or during extreme turbulence. Mechanical cage is used only when the entire computing mechanism has failed.

3. BASIC THEORY:

The basic computer mechanism in the A-4 sight is very similar in elevation and deflection; the same mechanisms are utilized in gunnery, rocketry and bombing.

Figure 2 shows the torques acting on the elevation computer shaft in gunnery. One item not shown is an air density instrument which modifies the time-of-flight information from the range servo. The angular position of the computer shaft is a measure of the total prediction angle and is transmitted to the sight head.

In deflection, the mechanism is the same except the accelerometer is omitted and the gyro is tilted to pick up a roll rate input.

In switching to rocketry, the range input is fixed and the reticle is initially depressed an angle determined by the rocket selected and the type of dive angle (steep or normal).

In bombing, and airspeed input is added and the reticle is depressed 10 degrees. This depression angle is fixed, the reticle motion being in deflection only.

It is pointed out that the A-4 sight computes entirely in the axis of the aircraft; the deflection prediction being parallel to the wings and elevation normal to the wings. In a bank, the gravity drop is modified to correct for bank angle.

Summarising, the "A" Series Sight in gunnery corrects for:

a. Time of flight of bullet (Range and Range Rate)

b. Relative target motion (angular rate).

c. Normal acceleration (number of "G's").

d. Altitude (air density).

In rocketry the sight corrects partially for rocket curvature, lead and bank angle.

In bombing the sight computes the automatic release point and corrects for drift.

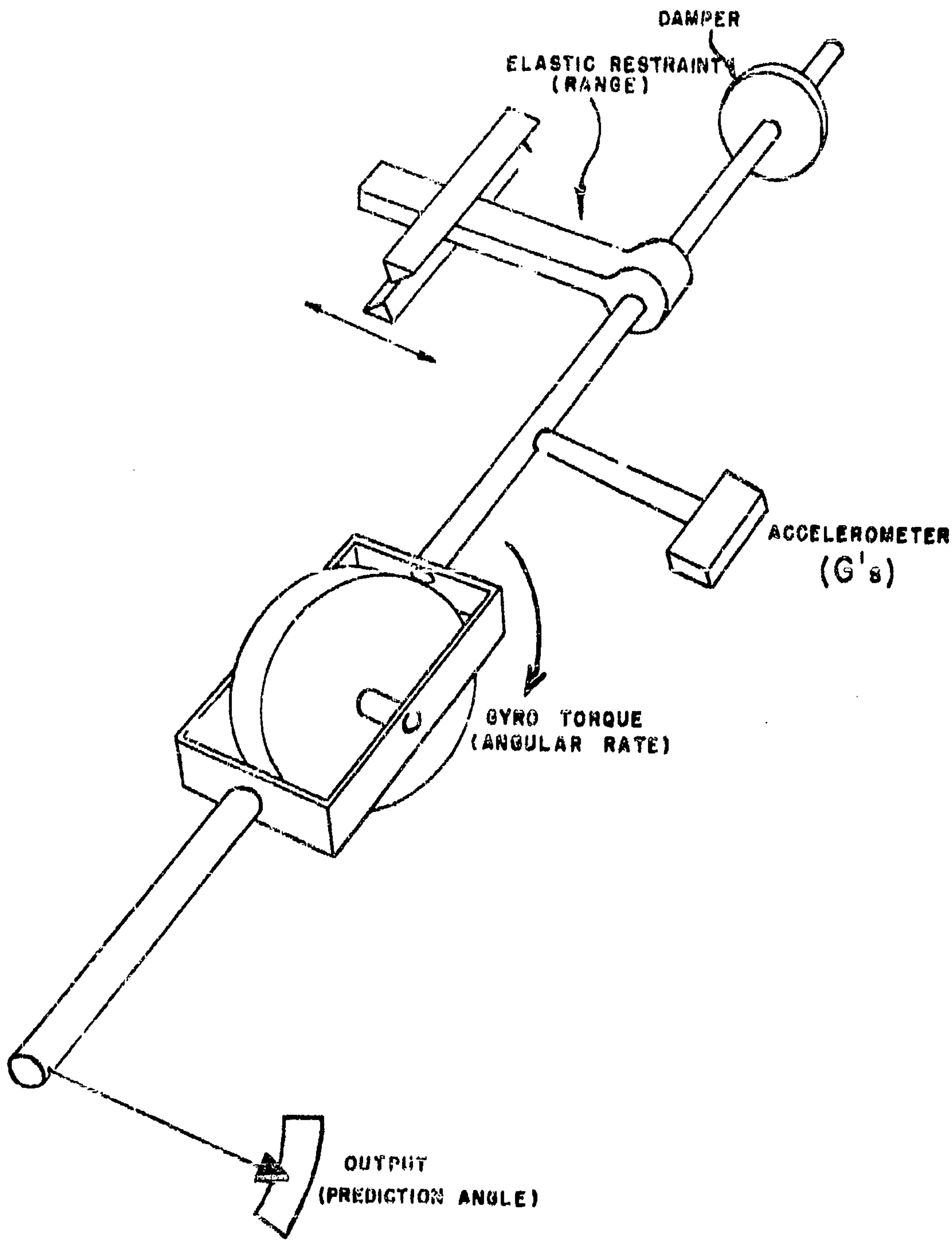


FIG 2

SIGHT MECHANISM

4. PRE-FLIGHT PROCEDURE: The frequency of aborted training missions can be considerably reduced if a few simple pre-flight checks are conducted by the pilot. After the sight is turned on in accordance with paragraph 1. a., the following procedure is recommended:

a. Note presence of reticle straight ahead in the windshield. (If off to one side, sufficient warm up time has not been allowed.)

b. With the sight in "Guns", twist the throttle grip slowly clockwise. The reticle circle should suddenly decrease in diameter to minimum and gradually increase as the control is advanced.

c. Back the throttle grip off to minimum reticle diameter and depress the caging button on the throttle. The reticle should move rapidly upward a noticeable amount. Return handle to normal position and release caging button.

d. Turn Function Selector to "rockets" and turn rocket selector through the six detent positions. The reticle should move downward in increments. Return to "Guns" position.

e. Turn the Function Selector from "Guns" to (bombs). The reticle circle should disappear and after a short pause reappear near the lower edge of the reflector. Return to "Guns".

f. At this point, a re-check of the switches is in order:

(1) Master switch — "Sight and Cam".

(2) Mechanical Cage Lever — "Uncage".

(3) Dimmer — To intensity required.

(4) Function Selector — "Guns".

5. IN-FLIGHT INDOCTRINATION: Before flying tracking or firing missions, it is recommended that each pilot fly at least one indoctrination mission to become acquainted with the behavior of the sight. The ultimate goal is for the pilot to get the "feel" of the system and to use correct procedures and techniques automatically. The following is recommended:

a. Leaving the throttle grip in the detent (radar) position and the sight in "Guns" electrically cage the sight and start a one needle-width turn. Uncage the sight and note the motion of the reticle away from the direction of turn. Advance the throttle grip just past the detent position (max. range) and note the large increase in lead. This situation occurs when tracking a target while the radar is "locking-on". During the lock-on transition, the range jumps rapidly from search (1400 feet) to lock-on range (4 to 6 thousand feet) with a resulting large, rapid increase in lead angle.

Repeat the above procedure using a two needle-width turn and note the increase in lead angles.

From the above it is noted that the lead generated (angle by which reticle "lags" the gun line) is roughly proportional to the range to the target and to the number of g's encountered.

b. Advance the throttle grip just out of the detent position (to max. range) and roll the aircraft slowly to the left and then to right. Note the reticle motion laterally across the reflector. Also note when rolling left, the reticle moves toward the left side of the reflector. Increase the rate of roll and note the increase in reticle motion.

The lesson to be learned from this procedure is that cross roll (rate-of-change of bank angle) represents an input to the computer and must be treated as such. All changes in bank angle should be accomplished smoothly and in a coordinated manner.

It is well to point out at this time that the sight can not discriminate between normal tracking inputs and erroneous inputs caused by moving the reticle with respect to the target. This will be discussed further under tactics.

c. Turn the function selector to rockets and the Rocket Selector to "5" HVAR Normal". Enter a long shallow dive tracking a specific target and note the response of the reticle to controls. In the rocket function the sight is extremely sensitive and corrections must be made smoothly and in a coordinated condition. This is particularly true of cross roll (change of bank angle) which will occur during a crosswind or moving target. Return RSU to "Guns".

d. With the BTW to "Bombing", enter a long shallow dive tracking a specific target. Note that a slight forward stick pressure is required and also that the required forward pressure increases as the range to the target decreases.

Level out and note the extreme sensitivity of the reticle in deflection (laterally) to either rudder action or cross roll.

Enter a 45 degree dive from 5,000 feet altitude at minimum airspeed tracking a ground target and holding the bomb button down. Before reaching 3,000 feet the entire reticle should disappear. This indicates an automatic release has been obtained and recovery should be started.

Flying straight and level, momentarily push the nose down violently. Note that a release indication is obtained in this manner. Similarly a release will be obtained in a very steep dive (60° or greater).

It is seen from the above that a premature release will be obtained if the aircraft is handled roughly or if too steep a dive angle is entered. The cage button must be held down during all entry maneuvers or violent aircraft motion to prevent a premature release. During the early phases of pilot indoctrination it is best to leave the bomb release selector switch in "manual" and release the bomb with the bomb button when the release indication is obtained.

6. USE OF THE SIGHT CAMERA: It has been shown at the Air Proving Ground that it is practically impossible to attain proficiency in the "A" Series Sights without sight cameras and proper assessment of the sight film. There are a number of camera installations in use today, the simplest method being to take the GSAP (AN-N6) camera from the wing and attach it to the sighthead. Methods of assessment are shown in pages 17 through 19.

7. GUNNERY (FIXED RANGE): It is recommended that pilots become proficient in fixed range firing before attempting to use the radar. It is pointed out, however, that the primary application of the A-4 Sight is with radar, the fixed range being used only when the radar fails.

The nominal conditions used at APG for fixed range firing are an angle off of 30 degrees and a slant range of 1250 feet. The reason for selecting 1250 feet is that this is the most probable setting of the range dial if radar failure occurs. To facilitate range and angle off measurement, a 2'-6" x 4'-6" elliptical bull is painted on the target which appears to be the same size and shape as the pipper at the desired condition.

It is recommended that a series of practice passes be made before firing in order to become proficient in positioning. It must be borne in mind that three distinct operations must be completed before firing:

a. Uncage the sight and generate a lead.

b. Align the reticle with the target in the uncaged condition.

c. Track the target momentarily before firing.

These three steps are generally accomplished in the following manner: With the sight electrically caged, roll into the attack placing the pipper an estimated fifty mils ahead of the target. Release the cage button and allow the reticle to drift back into the vicinity of the target. When the reticle has stabilized, make the final corrections to place the pipper on the desired aim point. Continue to track for approximately 1/2 second before firing.

It is absolutely essential that the pilot "follow through"

during firing. Although tracking during firing is very difficult due to reticle vibration, every effort must be made to keep the reticle as near as possible to the aim point. Avoid "freezing" the controls during firing.

g. GUNNERY (RADAR RANGING): In order to understand the behavior of the A-4 Sight with radar, it is necessary to briefly review the theory of lead. In general, the lead is roughly proportional to range and angular rate, or:

$$\text{Lead} = W \times R$$

When the sight is electrically caged in the "Guns" function, the range fed to the computer is approximately 600 feet (not zero! A small lead will be developed even when electrically "caged"). When the sight is uncaged and the radar is in "search" the range jumps to 1400' with a consequent increase in lead angle. When the radar locks on a target, the range jumps to as high as 6000 feet with a violent increase in lead. These shifts in reticle position are disconcerting to the pilot if he does not expect them nor understand their source. If the reticle is placed on the target during the early part of the pass, it will move considerably aft of the target when lock-on occurs. It is extremely difficult to realign the reticle with the target because the act of re-aligning introduces further angular rates which further increase the lead angle.

In order to avoid this situation, the following procedure is recommended:

a. Roll onto the approach placing the reticle well ahead of the target and uncage the sight. The amount of initial lead required can be estimated only with considerable practice. For this reason, a large number of "dry runs" (with sight camera) is required before any firing can be conducted.

b. As the reticle moves back to the vicinity of the target, make the final tracking corrections very smoothly and allow sufficient time for the reticle to "catch up" to the aircraft motion. If the reticle initially falls way off the target, recage the sight before making large corrections.

c. Track the target smoothly for at least 1/2 second before firing.

d. The remarks regarding "following through" made previously apply equally in this case. It has been found that radar performance must be high if effective long range firing is to be accomplished. If lock-on ranges are much less than 6000 feet or the radar breaks lock during a pass, it is futile to attempt to fire.

9. ROCKETRY: To put the sight in the rocket function, the function selector unit is turned from "Gun's" to "rocket" and the RSU turned to the rocket being used and the desired dive angle. (Dive angles below 38 degrees are considered "Normal"; above 38 degrees are "Steep".) Note the fact that the reticle moves down when the rocket function is selected. This is to compensate for the fact that rockets have a relatively large curvature (gravity drop).

It will be found that the A-4 Sight is very sensitive in the rocket function. Tracking corrections must be made smoothly; this applies to aileron as well as elevator and rudder. Above all a high degree of co-ordination (centering of the ball) must be maintained.

The technique for rocket firing is fairly straightforward. There are a few "cautions" to observe, however:

a. Hold the cage button down until the "turn in" is complete, the reticle on the target and the aircraft coordinated.

b. Avoid making large tracking corrections rapidly. If a large correction is required, move the reticle about 2/3 of the way to the target and pause momentarily to allow the reticle to "catch up" to the aircraft motion. If a very large correction is required, it is preferable to recage the sight long enough to realign the reticle with the target.

c. When attacking in the presence of a crosswind, a bank into the wind will be required to maintain coordinated flight. This change in bank attitude must be made smoothly since the sight measures this rate and modifies the prediction angle accordingly. As the slant range decreases the required bank will increase. Changing the bank angle in increments will result in instability in deflection.

d. In rough air the sight frequently "runs away" generating large, erroneous prediction angles. With sufficient practice, a pilot can recognize this "runway" condition and recage the sight. It is generally preferable to recage under these circumstances even if it means firing in the caged function.

e. Bear in mind, the shorter the slant range, the better the chance of hitting the target. Conditions permitting, it is preferable to "close in" and execute a high recovery effort.

10. DIVE BOMBING: Dive bombing is the most difficult of the three functions of the A-1 Sight. The system functions in the following manner:

The line of sight is depressed approximately ten degrees from the line of flight. Thus, when tracking a ground target, a nose-down angular

rate is developed. This rate is proportional to airspeed and becomes greater as the aircraft comes closer to the target. (This particularly is noticeable in a jet fighter where forward stick pressure is required and the required forward stick pressure becomes greater during the dive). When the bomb should curve away from the launching line by 10^0, (See Figure 3), the sight automatically releases the bomb. The reticle movement in bombing is in deflection only, the elevation angle being fixed 10^0 below the flight line.

It is pointed out the sight is extremely sensitive in the bomb function and smoothness with the controls is absolutely essential. There is a strong tendency for the sight to be unstable in deflection and great care must be used to prevent "runway". If a violent rudder, aileron or elevator action is required, the sight should be caged during the maneuver. The following procedure is recommended:

a. Before entering the five bomb run, move the Function Selector from "Gun" to "Bomb" and advance the range-wind setting to "0". (If the range-wind can be estimated, the BTW can be moved up or down wind. This is not a critical adjustment, however. This adjustment may also be used to overcome consistent early or late releases). Select "Manual" or "Automatic" release on the appropriate switch and operate the aircraft bombing switches as desired.

b. Use any entry tactic desired, but hold the cage button down until the reticle is on the target and the aircraft stabilized.

c. If the automatic system is being used, release the cage button, depress the bomb button and track carefully, maintaining forward stick pressure as required.

d. When the reticle disappears and a red light flashes in the windscreen release has been effected.

e. If the manual release system is used, the procedure is the same except the bomb button is not depressed until the reticle circle disappears. (Manual release is sometimes preferable in rough air).

Figure 4. shows the conditions under which a release may be expected.

11. GENERAL.: The use of the A-Series Sights is not a simple matter; the sight is a complex piece of equipment and requires considerable skill and understanding on the part of the pilot. A pilot should never be sent up on a mission involving use of the A-4 Sight until he has been thoroughly indoctrinated on its use.

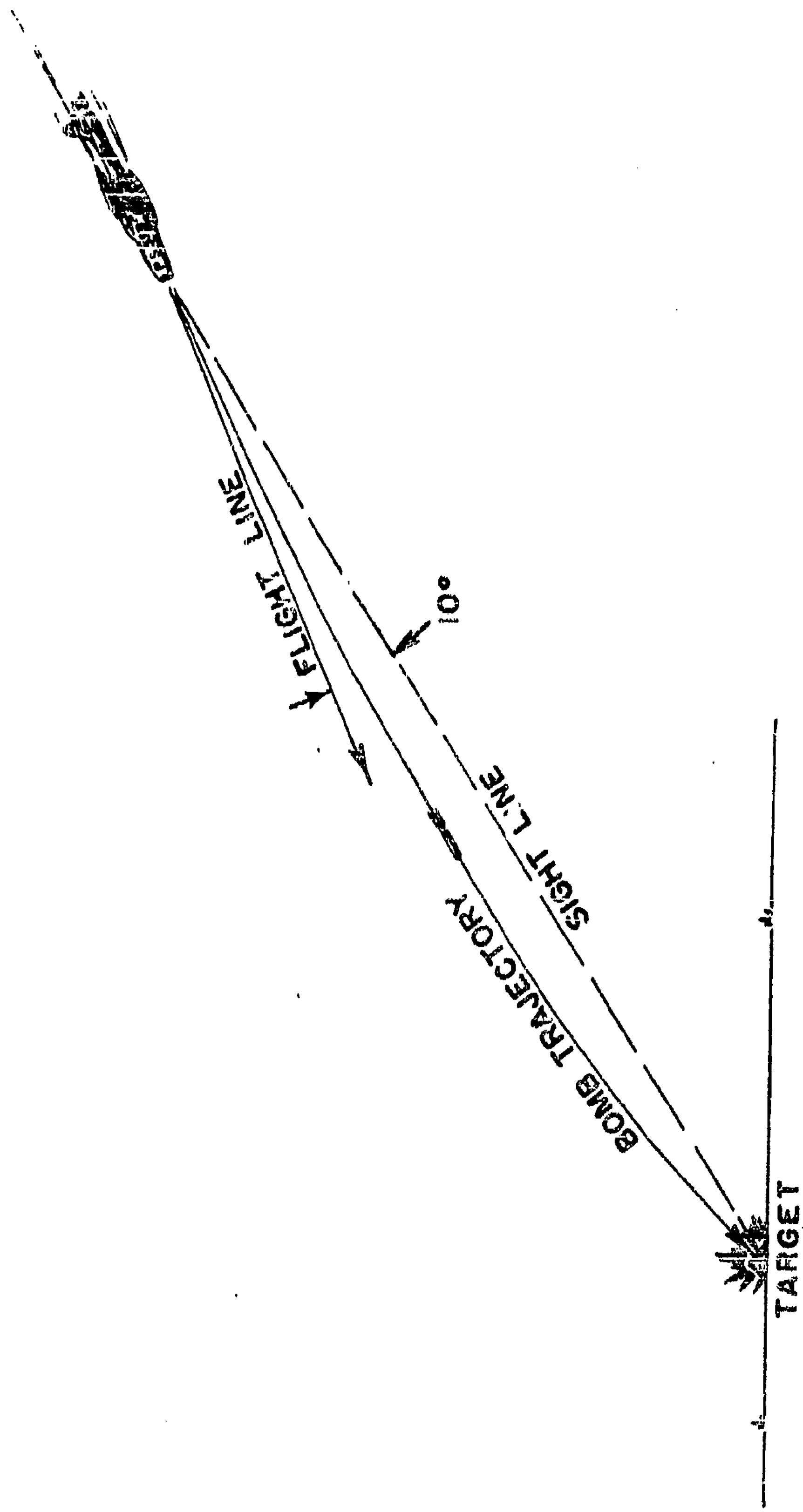


FIGURE 3

12. RETICLE CAMERA FILM ASSESSMENT:

a. Projector:

Any 16 mm projector will suffice although the W-2 Assessor set up is convenient since the required scale (1" = 10 mils) is already established. A simple means of obtaining this scale is to adjust the distance from the projector to the screen until the overall image size is 30.1" x 21.3". Once this distance is established, the screen may be left permanently in this position.

b. Range:

To determine range, lay the assessor across the target in such a manner that the height of the target is measured on the range scale, (See Figure 1).

c. Tracking Error:

Tracking error is determined by measuring the distance between the pipper and the desired aim point using the tracking error scale, (See Figure 2).

d. Angle off is determined by superimposing the cross in the lower left hand corner of the assessor on one corner of the target image and noting which diagonal index most nearly bisects the target. If the trailing edge of the target is frayed, the measurement may be taken from a leading edge corner of the bullseye, (See Figure 3).

AUTOMATIC BOMB RELEASE
A-1 GUN-BOMB-ROCKET SIGHT

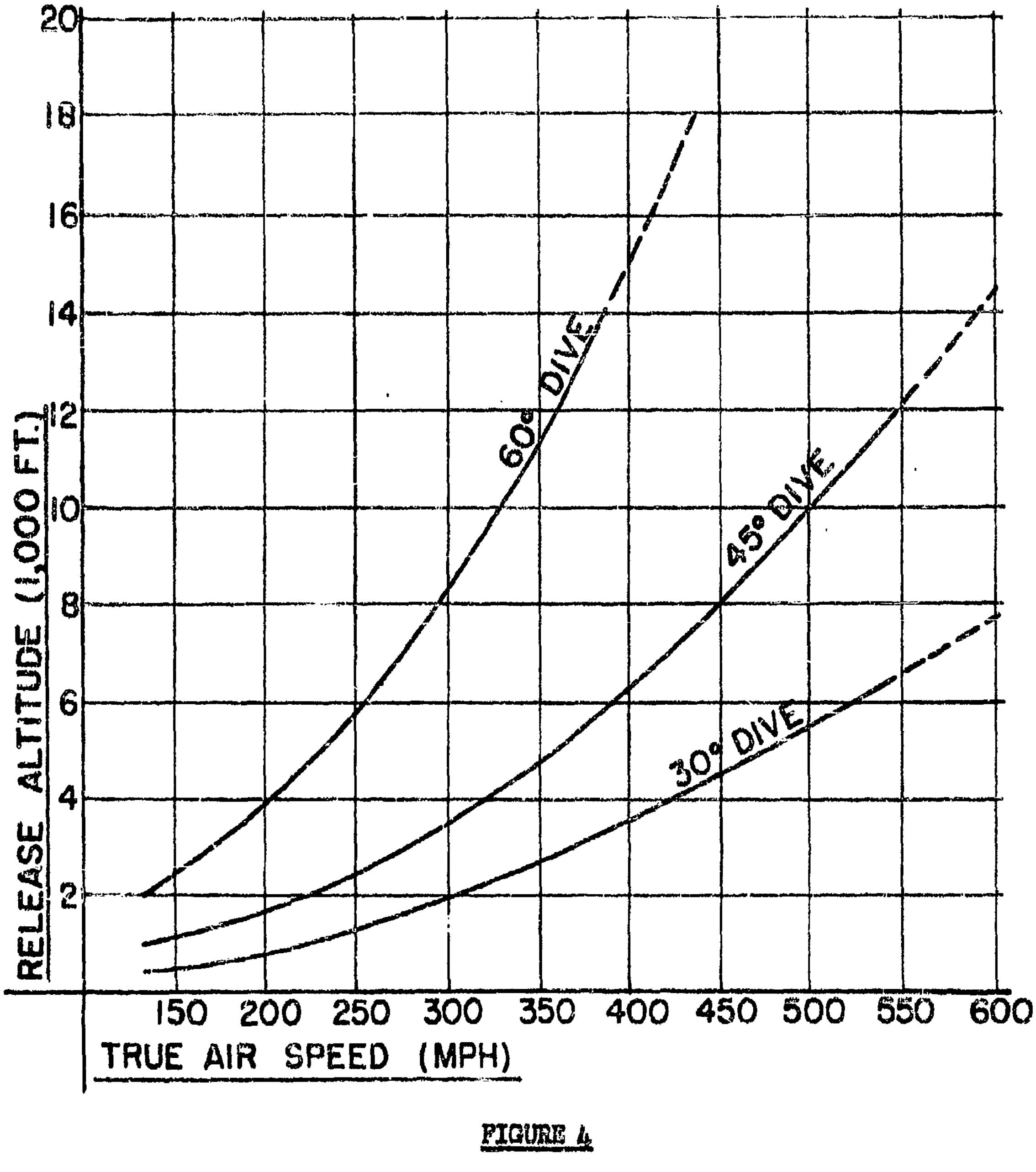
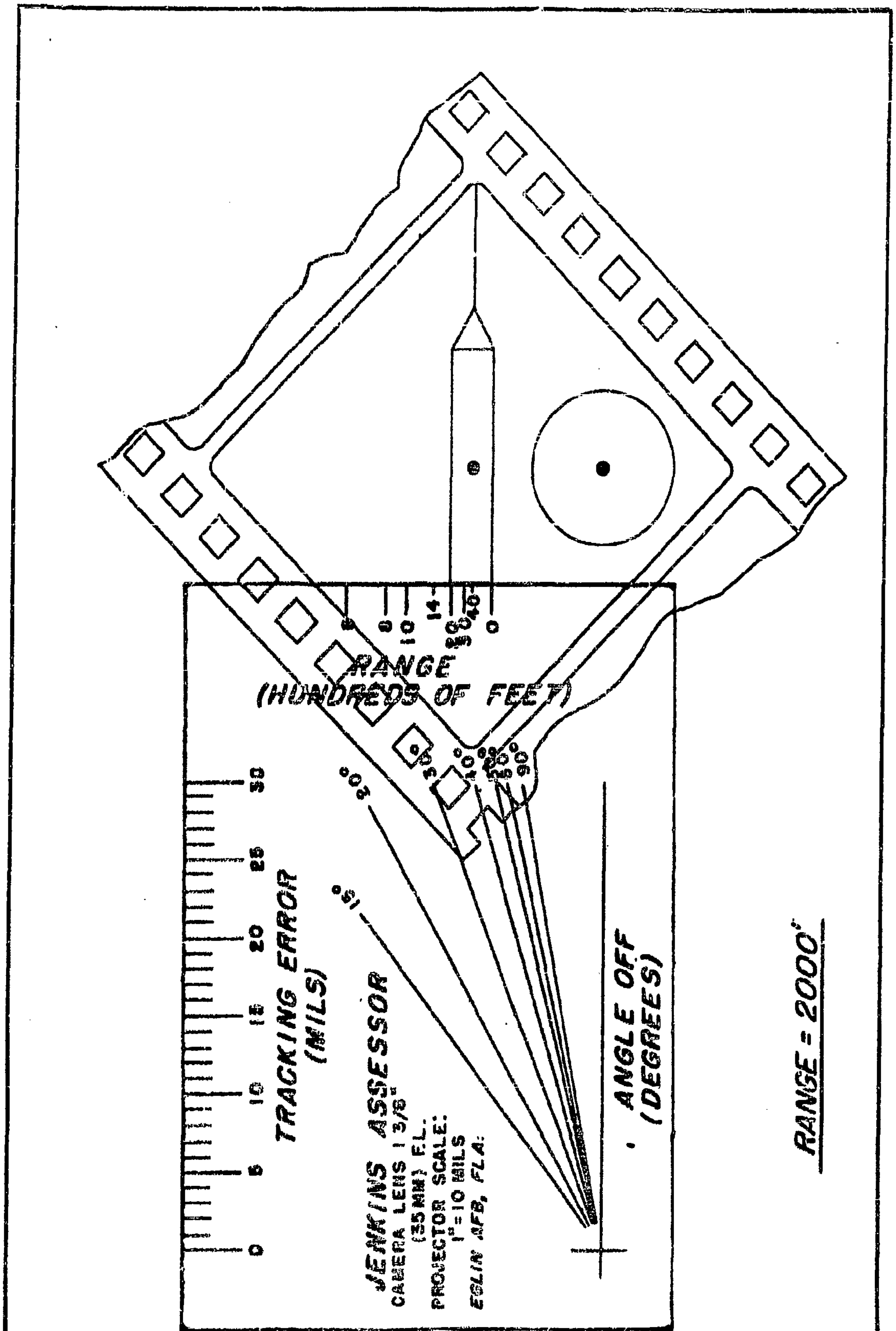
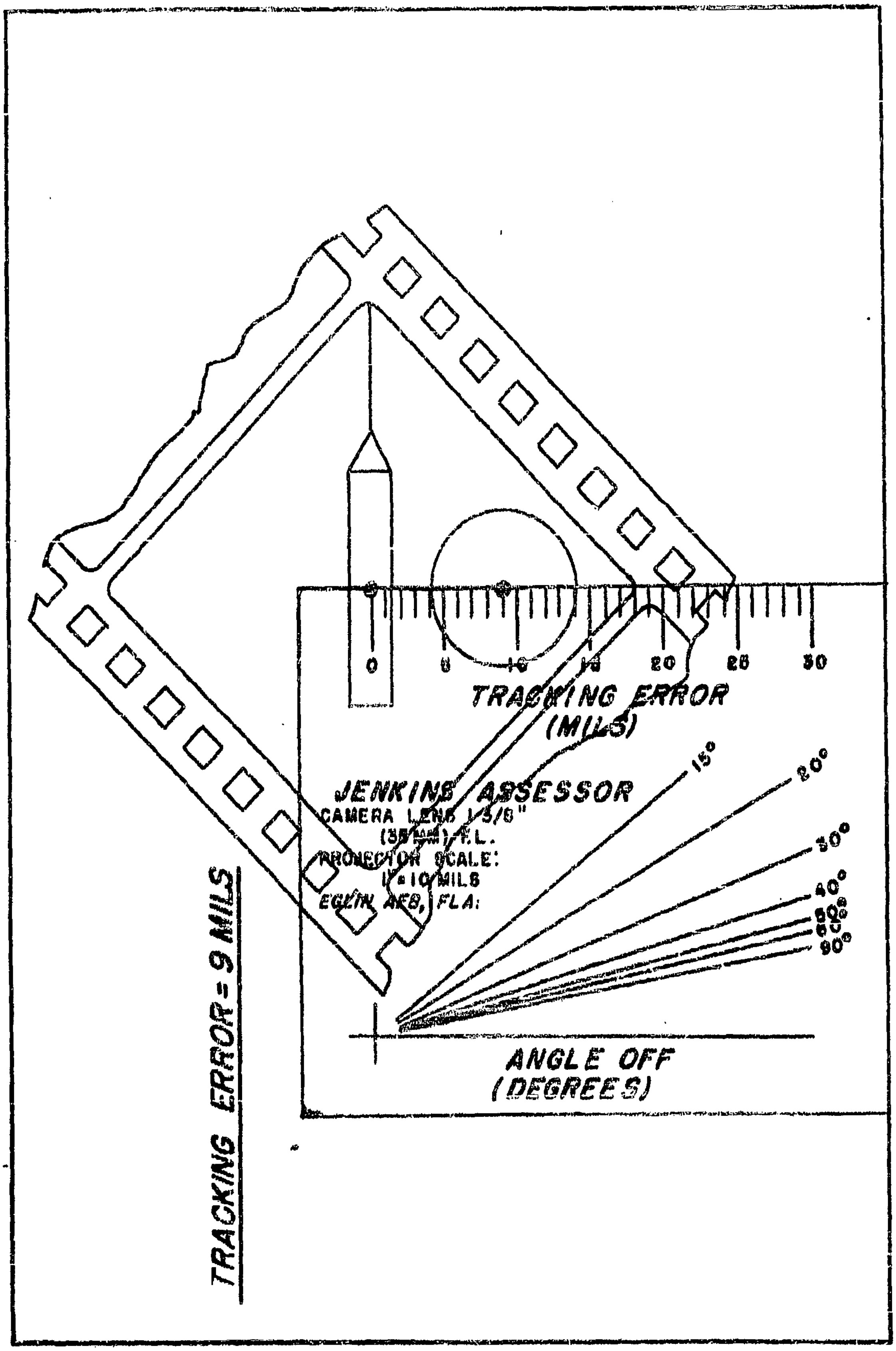
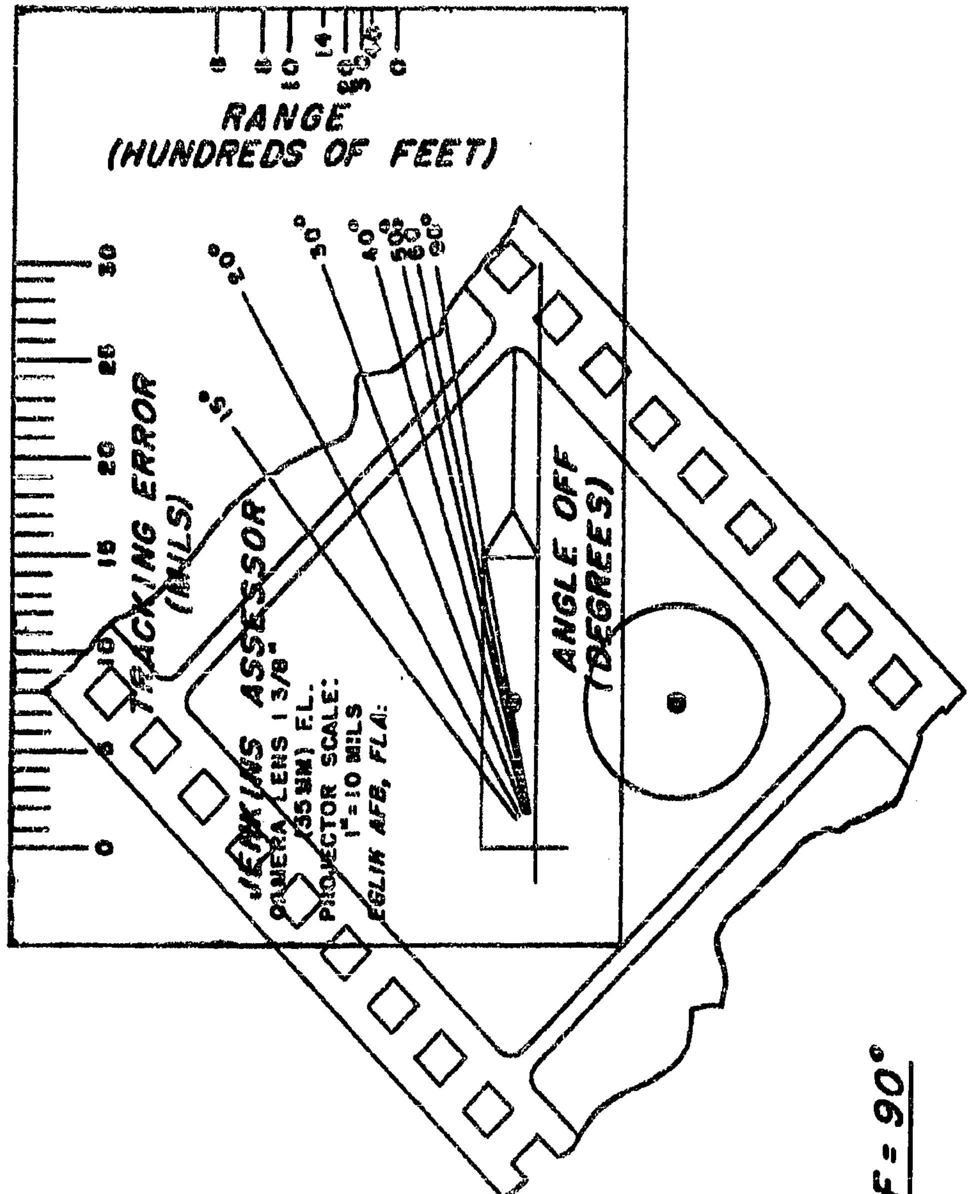


FIGURE 4


RANGE
(HUNDREDS OF FEET)
TRACKING ERROR
(MILS)
JENKINS ASSESSOR
CAMERA LENS 1 3/8" F.L.
(35MM)
PROJECTOR SCALE:
1"=10 MILS
EGLIN AFB, FLA.
ANGLE OFF
(DEGREES)
RANGE = 2000'


TRACKING ERROR
(MILS)
0
5
10
15
20
25
30
JENKINS ASSESSOR
CAMERA LENS 1 3/8"
(35 MM) F.L.
PROJECTOR SCALE:
1" = 10 MILS
EGLIN AFB, FLA.
15°
20°
30°
40°
50°
60°
90°
ANGLE OFF
(DEGREES)
TRACKING ERROR = 9 MILS


RANGE
(HUNDREDS OF FEET)
TRACKING ERROR
(MILS)
JENKINS ASSESSOR
CAMERA LENS 1 3/8"
(35 MM) F.L.
PROJECTOR SCALE:
1" = 10 MILS
EGLIN AFB, FLA.
ANGLE OFF
(DEGREES)

ANGLE OFF = 90°

13. RETICLE CAMERA INSTALLATION AND BORESIGHT PROCEDURES FOR A-4 GBR SIGHT IN F-86E AIRCRAFT

1. INTRODUCTION:

a. The reticle camera photographs the sight reticle superimposed on the target being tracked and provides the pilot with a record of his tracking for subsequent evaluation. The reticle camera provides an excellent training aid for practice gunnery missions.

b. The Air Proving Ground utililizes several photographic and optical systems for reticle camera installations. The following installation was chosen for its simplicity.

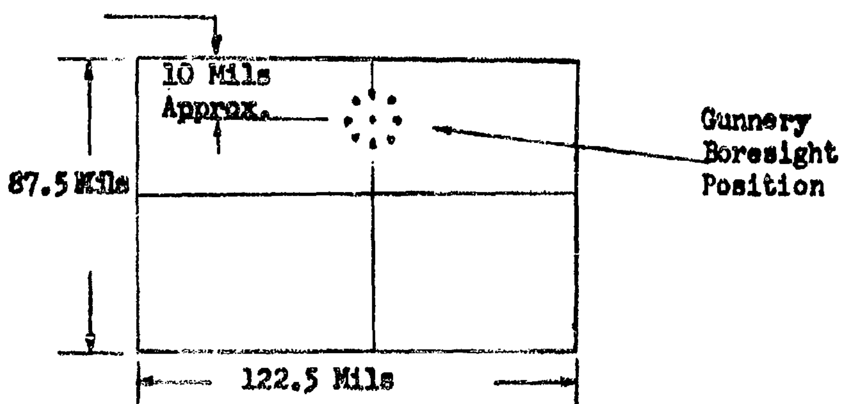
2. INSTALLATION:

a. Installation is very simple in that tapped holes for mounting the special camera mount are provided in the sight head. It is necessary only to bolt this mount to the sight head with standard aircraft hex head bolts SAE 10-32 5/8" in length.

b. A standard 16 mm GSAP camera with a 1 3/8" lens assembly should be used. The electrical leads to the camera are installed in parallel with the standard gun camera installation.

3. BORESIGHT PROCEDURE:

a. A standard gun camera boresighting kit is used for aligning the reticle in the frame as illustrated.



BORESIGHT PICTURE

If Appendix H is withdrawn (or not attached) the classification will be changed to Restricted in accordance with Par 25e AFR 205-1

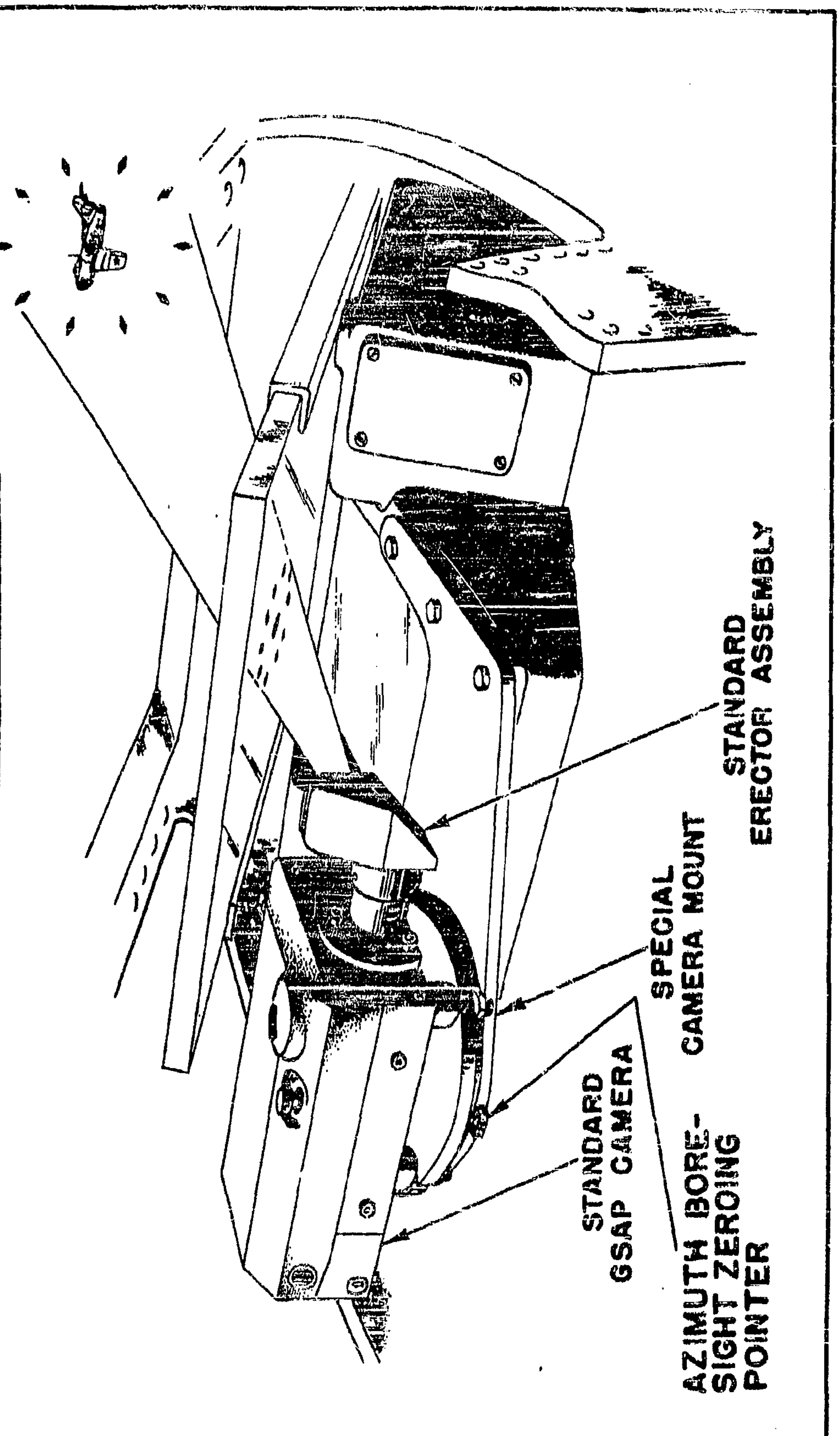
b. A 1-3/8 inch focal length should be used to give a greater area coverage on long range tracking missions. This increased area should be sufficient to insure full coverage of reticle movement throughout tracking.

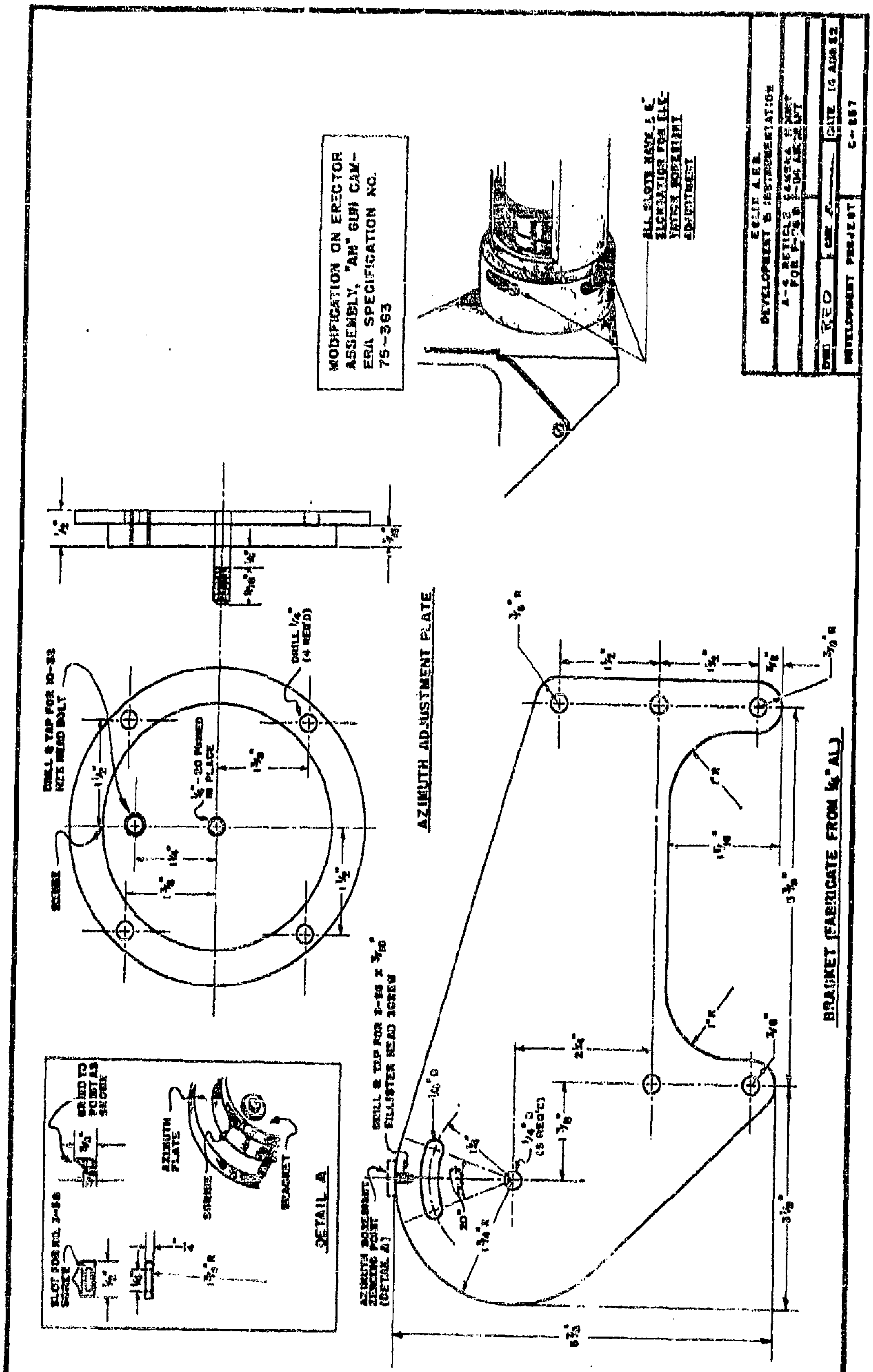
c. A ground boresight shot, with sight electrically caged, should be made whenever it is desired to measure prediction angles.

d. Satisfactory results have been achieved with super film using a camera speed of 32 frames per second and shutter stops of F8 to F16.

e. The following sketch and drawing, Figures 1 and 2, illustrate the camera mount and installation of the reticle camera for the A-4 Sight.

A-4 RETICLE CAMERA SYSTEM
FOR F-84 & F-86 AIRCRAFT




MODIFICATION ON ERECTOR ASSEMBLY, "AN" GUN CAMERA SPECIFICATION NO. 75-363
AZIMUTH ADJUSTMENT PLATE
BRACKET (FABRICATE FROM 1/8" AL)
DETAIL A
AZIMUTH PLATE
BRACKET

14. DESCRIPTION OF A-4 SIGHT:

The A-4 Sight is basically an A-1CM with three major improvements:

a. Calibration errors have been virtually eliminated.

b. Major components such as sighthead, computer, etc. are fully interchangeable.

c. Intensity of reticle illumination has been greatly increased. A number of minor changes have been incorporated such as the use of diamond dots instead of a reticle circle, improved accessibility of certain components, etc.

From the pilots standpoint, the reticle is easier to see, no "aiming fudge factors" are required and the in-commission rate is higher.

The major components of the sight are as follows:

a. Sight Head.

b. Computer

c. Amplifier

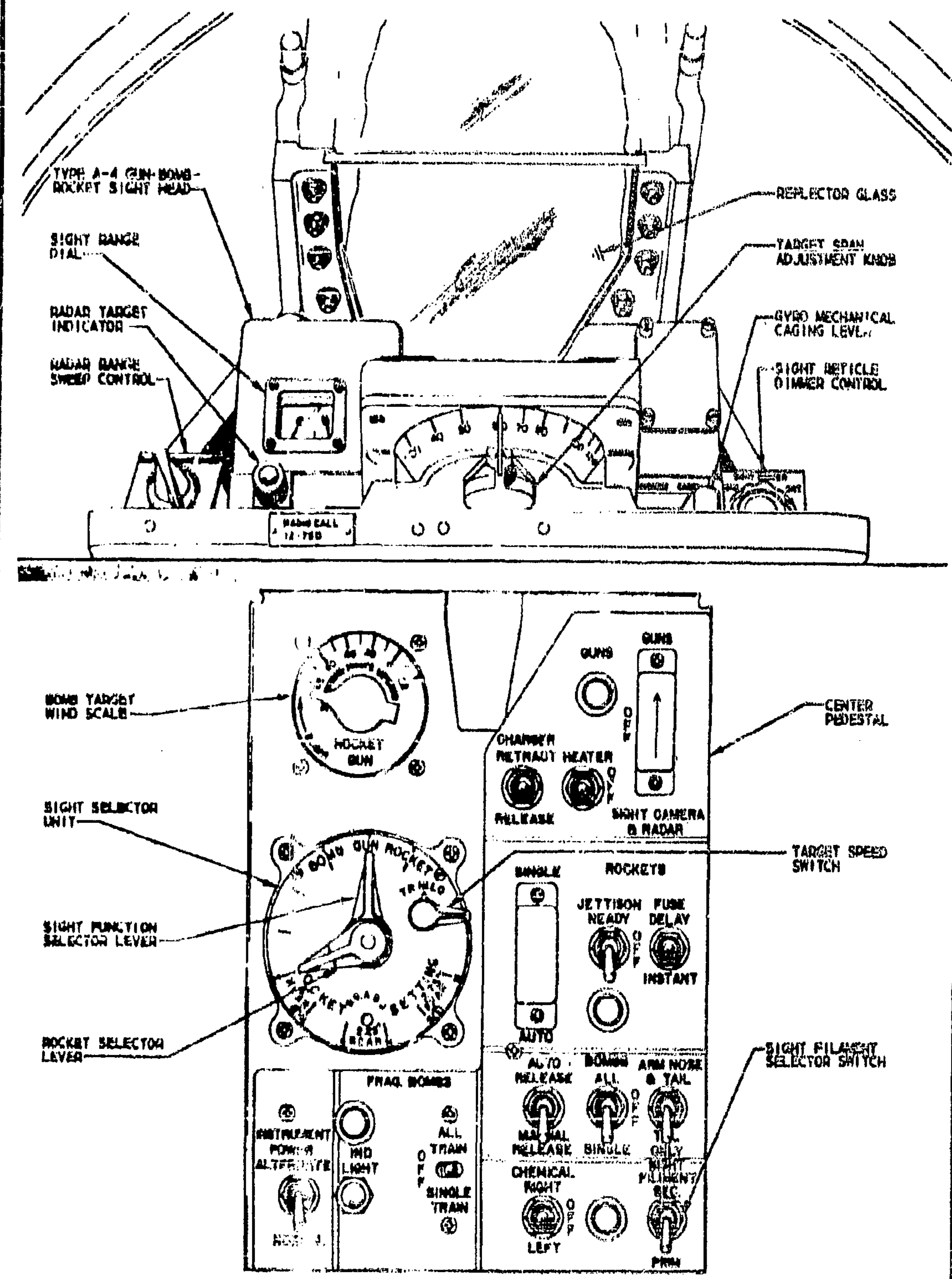
d. Power Supplies

e. Controls

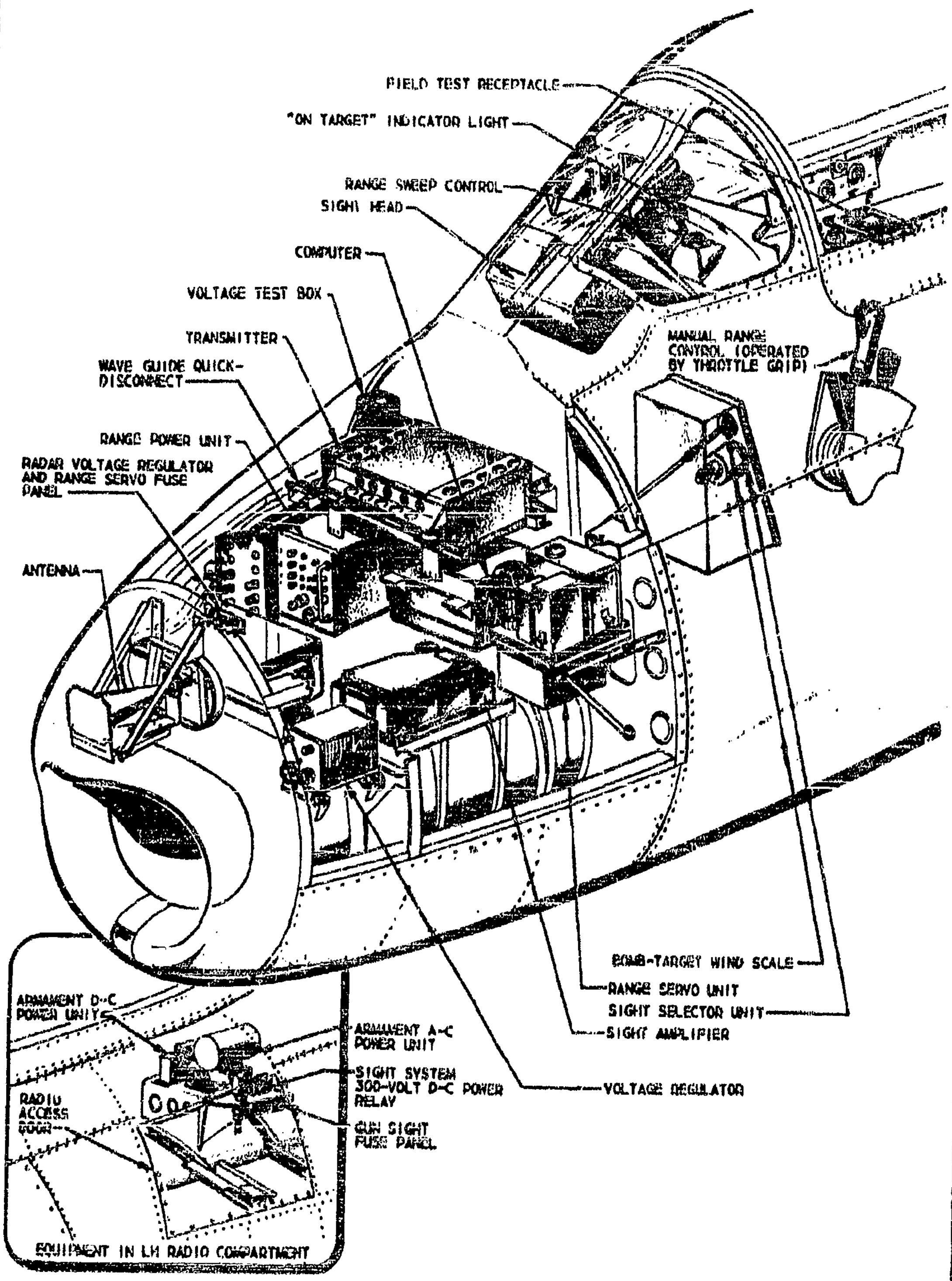
f. Range Servo

The Sight Head is mounted behind the instrument panel and projects the reticle on a reflector glass just behind the windscreen. The reticle image is "collimated" and appears to be at the range of the target.

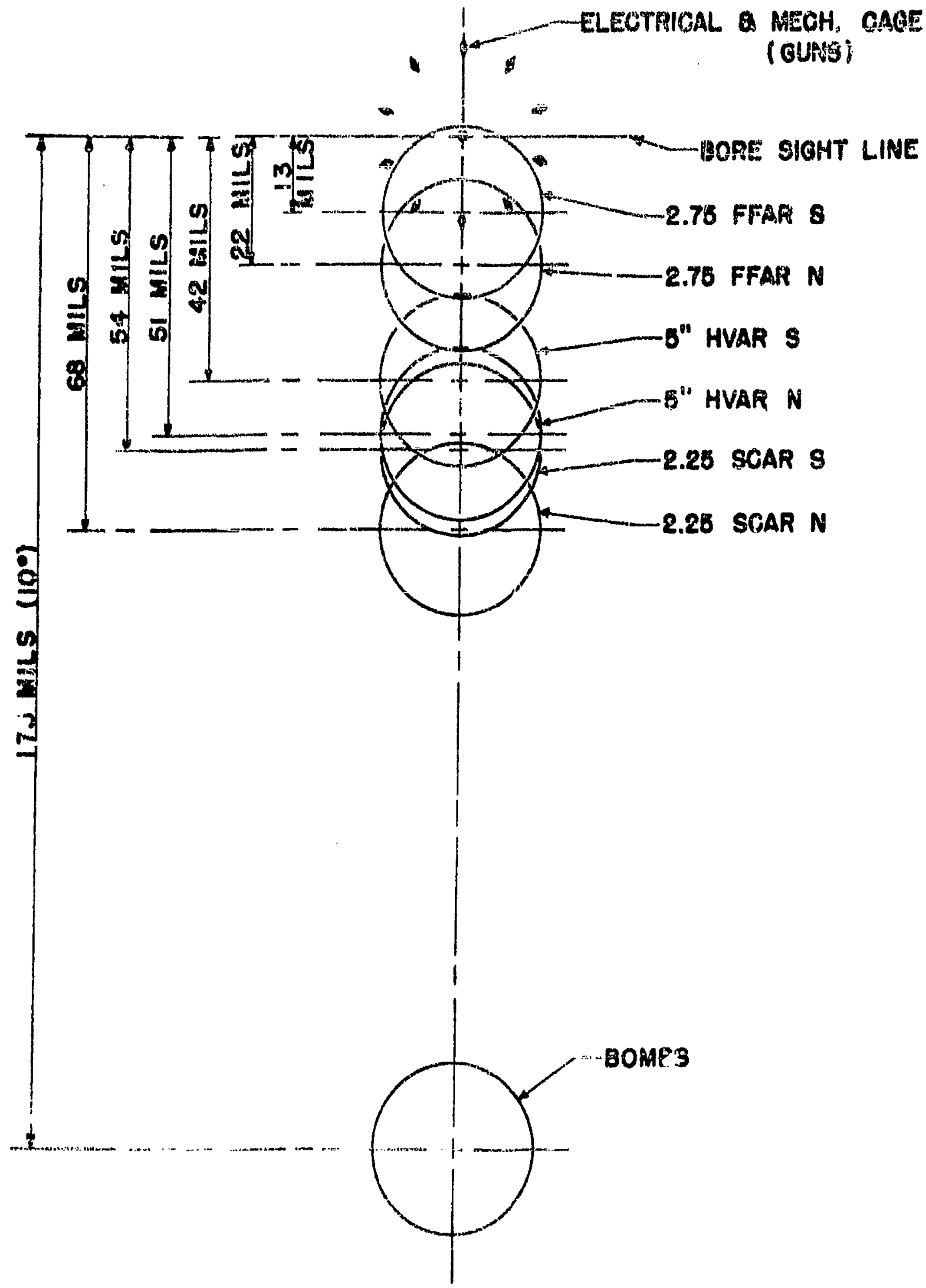
The remaining components are usually mounted in the nose of the aircraft.



A-4 Sight and Center Pedestal



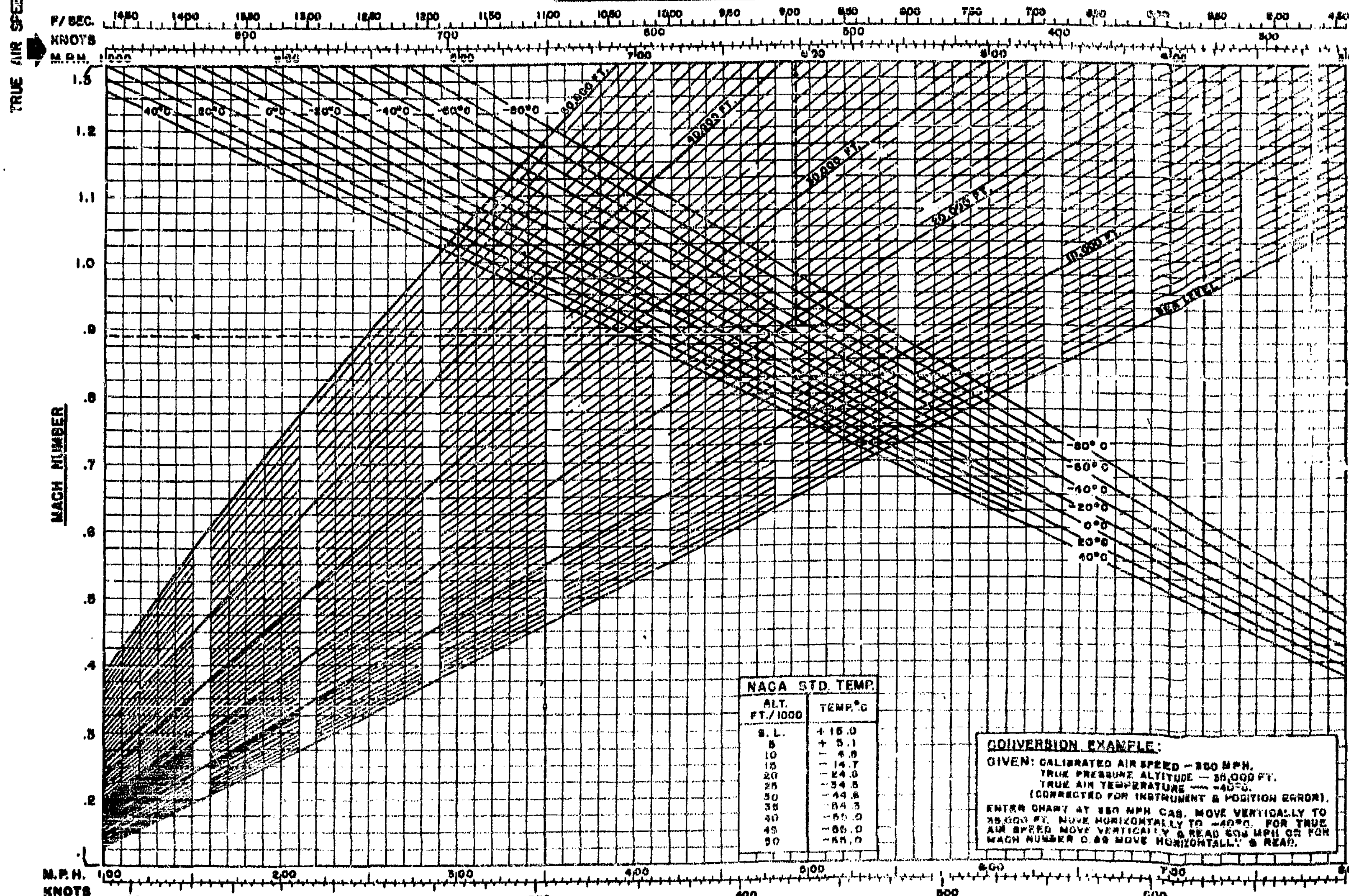
Type A-4 Sight System



RETICLE POSITION FOR VARIOUS SIGHT FUNCTIONS

SECRET
Security Information

TRUE AIR SPEED CHART



NACA STD. TEMP.	
ALT. FT./1000	TEMP. °C
S. L.	+ 15.0
5	+ 5.1
10	− 4.8
15	− 14.7
20	− 24.6
25	− 34.5
30	− 44.4
35	− 54.3
40	− 55.0
45	− 55.0
50	− 55.0

CONVERSION EXAMPLE:

GIVEN: CALIBRATED AIR SPEED — 350 MPH.
TRUE PRESSURE ALTITUDE — 35,000 FT.
TRUE AIR TEMPERATURE — −40°C.
(CORRECTED FOR INSTRUMENT & POSITION ERROR).

ENTER CHART AT 350 MPH CAS. MOVE VERTICALLY TO 35,000 FT. MOVE HORIZONTALLY TO −40°C. FOR TRUE AIR SPEED MOVE VERTICALLY & READ 605 MPH OR FOR MACH NUMBER 0.89 MOVE HORIZONTALLY & READ.

SECRET
Security Information

UNCLASSIFIED

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Armed Services Technical Information Agency

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TO Unclassified PER AUTHORITY LISTED IN

ASTIA TAB NO DATE 5 Aug 59

[illegible] AS IN ANY MANNER [illegible] THE HOLDER OR ANY OTHER [illegible] MISSION TO MANUFACTURE, [illegible] MAY IN ANY WAY BE RELATED THERETO.

UNCLASSIFIED

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE OHIO

FEB 19 2002

MEMORANDUM FOR DTIC/OCQ (ZENA ROGERS)
8725 JOHN J. KINGMAN ROAD, SUITE 0944
FORT BELVOIR VA 22060-6218

FROM: AFMC CSO/SCOC
4225 Logistics Avenue, Room S132
Wright-Patterson AFB OH 45433-5714

SUBJECT: Technical Reports Cleared for Public Release

References: (a) HQ AFMC/PAX Memo, 26 Nov 01, Security and Policy Review, AFMC 01-242 (Atch 1)

(b) HQ AFMC/PAX Memo, 19 Dec 01, Security and Policy Review, AFMC 01-275 (Atch 2)

(c) HQ AFMC/PAX Memo, 17 Jan 02, Security and Policy Review, AFMC 02-005 (Atch 3)

1. Technical reports submitted in the attached references listed above are cleared for public release in accordance with AFI 35-101, 26 Jul 01, *Public Affairs Policies and Procedures*, Chapter 15 (Cases AFMC 01-242, AFMC 01-275, & AFMC 02-005).

2. Please direct further questions to Lezora U. Nobles, AFMC CSO/SCOC, DSN 787-8583.

Lezora U. Nobles

LEZORA U. NOBLES
AFMC STINFO Assistant
Directorate of Communications and Information

Attachments:
1. HQ AFMC/PAX Memo, 26 Nov 01
2. HQ AFMC/PAX Memo, 19 Dec 01
3. HQ AFMC/PAX Memo, 17 Jan 02

cc:
HQ AFMC/HO (Dr. William Elliott)

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE OHIO

JAN 17 2002

MEMORANDUM FOR HQ AFMC/HO

FROM: HQ AFMC/PAX

SUBJECT: Security and Policy Review, AFMC 02-005

1. The reports listed in your attached letter were submitted for security and policy review IAW AFI 35-101, Chapter 15. They have been cleared for public release.

2. If you have any questions, please call me at 77828. Thanks.

James A. Morrow

JAMES A. MORROW
Security and Policy Review
Office of Public Affairs

Attachment:
Your Ltr 14 January 2002

14 January 2002

MEMORANDUM FOR: HQ AFMC/PAX
Attn: Jim Morrow

FROM: HQ AFMC/HO

SUBJECT: Releasability Reviews

1. Please conduct public releasability reviews for the following attached Defense Technical Information Center (DTIC) reports:

   a. *Flight Test Program for Model P-86 Airplane Class – Jet Propelled Fighter*, 2 December 1946; DTIC No. AD-B804 069.

   b. *Physiological Recognition of Strain in Flying Personnel: Eosinopenia in F-86 Combat Operations*, September 1953; DTIC No. AD- 020 375.

   c. *Phase IV Performance Test of the F-86F-40 Airplane Equipped with 6x3-inch Leading Edge Slats and 12-inch Extensions on the Wing Tips*, May 1956; DTIC No. AD- 096 084.

   d. *F-86E Thrust Augmentation Evaluation*, March 1957; DTIC No. AD- 118 703.

   e. *F-86E Thrust Augmentation Evaluation*, Appendix IV, March 1957; DTIC No. AD- 118 707.

   f. *A Means of Comparing Fighter Effectiveness in the Approach Phase*, October 1949; DTIC No. AD- 223 596.

   g. *War Emergency Thrust Augmentation for the J47 Engine in the F-86 Aircraft*, August 1955; DTIC No. AD- 095 757.

   h. *Operational Suitability Test of the F-86F Airplane*, 4 May 1953; DTIC No. AD-017 568.

   i. *Estimated Aerodynamic Characteristics for Design of the F-86E Airplane*, 26 December 1950; DTIC No. AD- 069 271.

   j. *Combat Suitability Test of F-86F-2 Aircraft with T-160 Guns*, August 1953; DTIC No. AD- 019 725.

2. These attachments have been requested by Dr. Kenneth P. Werrell, a private researcher.

3. The AFMC/HO point of contact for these reviews is Dr. William Elliott, who may be reached at extension 77476.

JOHN D. WEBER
Command Historian

10 Attachments:
a. DTIC No. AD-B804 069
b. DTIC No. AD- 020 375
c. DTIC No. AD- 096 084
d. DTIC No. AD- 118 703
e. DTIC No. AD- 118 707
f. DTIC No. AD- 223 596
g. DTIC No. AD- 095 757
h. DTIC No. AD- 017 568
i. DTIC No. AD- 069 271
j. DTIC No. AD- 019 725